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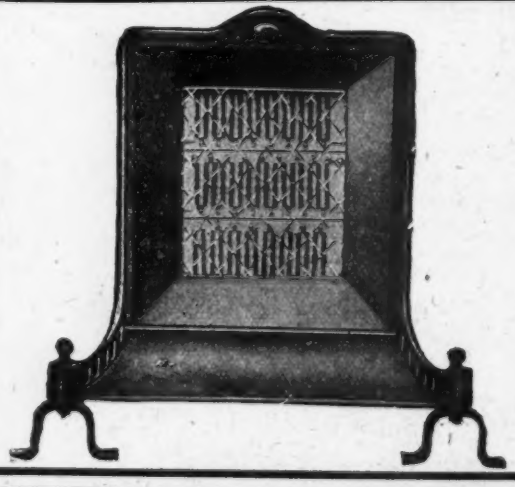

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ELECTRICAL REVIEW.

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THE CONTROL OF INDUSTRY.

WE summarise elsewhere the interesting report of the Nationalisation Committee of the Federation of British Industries. This report contains much that is food for careful thought. It claims to be a pronouncement of policy of a constructive kind by employers, and to offer an alternative to the suggestion of nationalisation.

The Committee is, in actual fact, an anti-Nationalisation Committee, and it ascribes to what it calls "the capitalist system" all the credit for any prosperity that has been enjoyed. In the public mind a capitalist is not very far removed from a particularly bloated form of profiteer, and in these days any system which evolves individuals of this character is liable to condemnation at sight. However, the meaning is made clear, and it is admitted by all who have thought of the subject at all that funds are necessary for the commencement and carrying on of any commercial undertaking. The truth is, of course, that the ultimate and only source of any kind of wealth is labour applied, directly or indirectly, to land. The maintenance of the operation of extracting wealth from land, whether at first or at *n*th move, must be carried on by the provision of funds which, as the report states, represent the previous accumulation of wealth by the efforts and savings of individuals. The implication that capital consists of savings, and that savings are the only capital there can be, is erroneous, for the real original capital is the land; savings are a secondary form, derived from the first.

Great importance is rightly laid on our export trade, but it is very far from correct to suggest that it is the export of manufactured goods which pays for the essential foodstuffs and raw materials needed for subsistence. Coal, a raw material, is one of our most important exports, if not the chief of them all; and one of the worst effects of the coal shortage is the lack of freight for the ships on their return journeys after bringing imports to the country. Then the services rendered by our shipping pay for a large proportion of our imports, and the Capitalist system cannot rightly claim that by the stimulation of the production of manufactured goods for export has our existence alone been rendered possible.

The elimination of unnecessary duplication of effort by the combination of large concerns is, as we have previously shown, a necessary feature of present-day business, and the Committee on Trusts was very far from condemning indiscriminately such amalgamations. It is stated that the ugly feature of exploitation of the consumer has been very much exaggerated, and that, on the whole, he has benefited from the existence of combines.

Modern business organisation renders impossible that personal contact between employer and employed which formerly existed. The control of labour is exercised through paid officials, who, however worthy, cannot be regarded in

the same intimate and familiar way as the old small proprietors.

The waste of natural resources has largely been due, particularly on the other side of the Atlantic, to the reckless haste to get rich displayed by lumber kings, oil monarchs, and other similar potentates.

Labour demands nationalisation and democratic control, and the report frankly admits that the views of the Committee are set out by means of a number of general statements. Thus, it is laid down as a general proposition that centralised management by a Government department is fatal to commercial efficiency and enterprise. State ownership need not necessarily be accompanied by State management. Incidentally, it is worth while considering what it is that is wrong with State administration. The Government official is popularly supposed, and this with some truth, to be a non-committal, evasive kind of person, and the Government Department to be but a very slightly improved form of Dickens' Circumlocution Office. Any man, however able and successful in business, has only to join the staff of the Min—well, perhaps we had better be non-committal ourselves—of a national or even municipal department to become a parasitic, inefficient, overpaid and underworked member of "the ravenous horde which preys upon the vitals of the community," as we have heard it expressed. It is from experience that we say that "the vitals of the community" provide remarkably poor feeding, and that the inefficiency of many large privately-owned commercial undertakings, both here and on the Continent, can give points and a beating to any public office. "Can I push this job on to someone else?" seems to be the constant question. If yea, in legal phrase, then let it be done.

It may be admitted at once that it is far better for the State not to administer any business in which competition is, from any point of view, advantageous. If a service is universal—such as drainage, roads, post, and so forth—public ownership is much better and easier to administer than private. As regards those "public services, the activities of which must be co-ordinated over large areas if they are to obtain real efficiency," for which we may read "the railways," the report suggests amalgamation or co-operative working under proper safeguards. Perhaps the railways would be worse under State management, though some of them would find it difficult. Perhaps, also, great railwaymen are the best statesmen, though this has not been tried out yet for a sufficient length of time to make the impression perfectly clear and definite.

The Committee's report endorses that of the Government Committee on Trusts in recommending that the duties shall be thrown upon the Board of Trade of inquiring into any reasonable complaints by means of a tribunal, and of recommending to the State action for the remedy of any grievances which the tribunal may find to be established. The lightning-like rapidity of such procedure, bearing as it does a marked similarity to the mills of God, will be manifest, and will at once remove all apprehension from the most timorous.

Democratic control is accepted so far as the Whitley Report achieves it, but no consciousness is betrayed of the defect from which the Whitley scheme suffered in the initial stages—the omission of the trained staff. This is expected to be the agent of Capital, and the signs of the times most distinctly show that this will not work. The Committee does not consider that workers desire, or should have, seats on the directorate. The Ebbw Vale Steel and Iron Co., Ltd., recently offered one or more such seats to the workers, but they were refused.

Profit-sharing is not encouraged, as it is found to be seldom worth the trouble. Payment by results is advocated, and confession is made "that in some cases individual employers have unjustly cut piece rates." This policy has been more general by far than this careful statement seems to show, but we may hope that it will quickly disappear.

The function of the State is to govern, and to remain independent of the cares of ordinary industry, and with this conclusion many will be found to agree.

Australia as Electrical Importer and Manufacturer Too.

We have before us the last two annual reports of the Electrical Traders' and Contractors' Association of Victoria. That for the year ended April, 1918, issued during the height of the war, contained references to the difficulties of maintaining trade owing to the restriction of imports from Great Britain and elsewhere—imports upon which the electrical trade in Australia was so greatly dependent. That trade was, in fact, chiefly kept in being, by means of large importations of electric wiring accessories from Japan. Naturally enough this help was appreciated by those to whom it came as a temporary relief, but coupled with that appreciation there existed the hope, perhaps we might call it resolution, to return to British manufacturers when things became normal. The report a year ago fittingly remarked:—"The true British spirit existing in this part of the Empire will cause us to give every consideration to the Mother Country, which she can so rightly expect from us in helping her in the commercial struggle which must be maintained after this gigantic conflict, in order to maintain our glorious position in the world, and to finance the burden of the war debt." In addition to being compelled by the sheer necessities of the situation to import Japanese electrical manufactures, Australia also turned her attention more than she had ever done before to the development of manufacturing within her own territory. This course has been adopted quite as much with a view to securing self-preservation—just as we need protection of our key industries—as for meeting immediate needs. The same report that foretold a return to importation from Britain when things became normal again also expressed satisfaction at the fact that the war had been the means of strengthening and developing in Australia the manufacture of electrical apparatus and some lines of accessories. The report says:—"We look forward with hope that the establishment of this branch of the trade will not be of passing moment, but will continue to develop in the interest of those firms who have so nobly come forward to fill the gaps which otherwise would have existed. We wish these new industries every success, and trust that they may long continue to be a valuable asset to this part of the Empire financially, and to that section of the industry in which we are interested." The report was signed by Mr. Geo. L. Just (of the Edison & Swan Electric Co.), the president of the Association then, and for several years previously, who last spring left Melbourne for a visit to this country and the States. There is nothing irreconcilable in the two views—importation from the Mother Country and manufacture in Australia. The market out there for electrical manufactures is a very large one, and what with arrears and projected developments, the demand will be large enough to give British exporters a fine opportunity, given Australian State discrimination against

cheap and nasty and trade-mark-infringing Japanese productions, which is practically certain, and a generous preferential policy toward British-made goods, which may be regarded as an absolute certainty.

When we turn to the report of the Association for the year ended at April, 1919, we find the new president, Mr. E. D. Patterson (of Warburton Franki, Melb, Ltd.), dealing with the new situation following the cessation of hostilities. "Commercially," he says, "the problems resulting from the changed conditions are at present engaging the attention of our members to a very great extent, but we hope that ere long business will have resumed it normal course, and that the present anxieties of commercial men will be materially reduced. It is, however, now possible for members to carry into practice, to a degree which during the past four years has not been possible, the policy of preference to British-made goods, which policy the Association has always supported, and now that certain barriers to inter-Empire trade are being removed, we feel certain that members in their commercial relationships will bear in mind the paramount claims of the Mother Country." In these terms the Association Council is but expressing the sentiments which are held by multitudes of business men and women in Australia, and are so much welcomed by us at Home. So determined and consistent has been the Australian method, under Mr. Hughes, the Prime Minister, and those who have advised and co-operated with him, of dealing with the products of the Central Empires which plunged us into bloody, devastating, and ruinous war, that it is not likely that the Mother Country's interests will be forgotten in the trying days ahead when large export trade will be so essential for us if we are to be enabled to hold our heads erect and withstand the commercial attacks which will be levelled at us from friend and foe alike. But something in the nature of apathy on the part of the British manufacturer even in presence of these sentiments and determinations, inconceivable as it may seem to be to some, may be laid as a charge against us unless we show an ampler solicitude and response than have yet been revealed. So far as Australian manufacturing is concerned, the British manufacturer need not hold his hand on that score—indeed, we believe that some of our engineering and electrical firms are among those which have undertaken, or contemplate undertaking, the erection of Australian factories. There is no question whatever that American electrical traders do not intend to leave the ground if they can help it. That is an additional reason, and a very important one, why we should leave no stone unturned to revive and strengthen all our Australian trade connections and lay ourselves out to meet what will unquestionably be the vast electrical and allied needs of the Commonwealth. The Council of the Association referred to, writing last April, says:—"There are indications that the (electrical apparatus) industries which have been thus established under stress of war conditions will not cease at the declaration of Peace, but will help in no small degree in maintaining the prosperity of that branch of Australian industry which is represented by the electrical trade."

Swedish Railways.

It is announced from Stockholm that General Director Granholm and the other members of the State Railways Administration, who had journeyed to Switzerland in order to investigate the arrangements being made there for the conversion of the railways to electric traction, have returned to the Swedish capital impressed with the fact that electrification is proceeding so well in Switzerland that no hesitation is any longer shown there in regard to undertaking the work on a large scale. The visitors state that the conversion from steam to electricity in Switzerland is now considered to be a national obligation, and less regard is had to the expenditure on the work than to the advantages which the adoption of the system confers. The main result of the inquiry is the formation of a definite opinion by the Swedish railway managers that the work of converting the State railways in Sweden should be undertaken as quickly as possible.

ELECTRIC TRANSMISSION.

By GEO. V. TWISS, M.I.E.E.

At the recent meeting of the I.M.E.A. at Felixstowe, Mr. S. L. Pearce read a paper entitled "Some Electric Transmission Considerations," of which paper an abstract appeared in the Electrical Review of July 4th, 1919. This paper is illustrative of the present controversy in respect of which the Electrical Review, in an editorial of June 27th, 1919, makes the comment that other questions of electric supply seem to have given place to the problem as to whether transmission of electricity should be overhead or underground. Mr. Pearce's paper contains a deal of very interesting matter relative to the merits of the underground and overhead systems respectively, and Mr. Pearce is to be complimented upon his valuable contribution to this subject; all thanks are due to him for the preparation and compilation of the comparative data he gives, which obviously represents an enormous amount of time and trouble. One would wish to let the matter go at that, but as it has happened, in the discussion following the paper, a number of engineers who hold the view that main transmissions should be by underground cables, apparently adopted the paper as written in support of that view. One would prefer, however, to think that this paper is a quite impartial one—it is thus that the writer regards it, and in response to a request he now contributes the following discussion upon the subject.

To completely go into the matters raised would necessitate recourse being had to the data upon which the calculations are based, and probably further necessitate the getting out of additional data and figures. Time and circumstances unfortunately will not permit of this for the present, and the writer therefore hopes to be excused if he confines himself to a general discussion of the matter.

As opposed to the above-mentioned view apparently taken by some engineers in the discussion, the main object of the paper would appear to be to show, *inter alia*, that because of the cost of transmission by whatsoever system, it is not economical to remove generation from a local utilisation point to a distant generating or, say, super-station point, unless the saving in generation costs at least balances the extra costs of transmission thereby necessitated, and from the data given certain limits may be seen. As the cost of transmission is materially affected by the method of transmission employed, this necessarily brings in as a complementary consideration the comparative costs of respective methods.

The axiomatic condition mentioned that electrical energy should be generated at the centre of gravity of the load is, of course, true, but its interpretation is dependent upon how broadly or narrowly the term "load" is used, and the "breadth of England" may divide varying interpretations of this term. Generation at the centre of gravity of the load according to the interpretation may be to generate in the hall or a central position in each building; or, again, in a centrally situated building in each street, or at a central point in each district, each town, each main area, or the country itself. It is purely a matter of the degree of centralisation which in turn predicates the complementary counterpart—transmission which is almost entirely a matter of voltage. Were the voltage available to us limited to, say, 4 volts, then the greatest degree of centralisation practicable would be to generate in a central position in each building, and to generate in a local station in the centre of gravity of the town load would be quite unjustified economically. If, say, 25 volts were available, perhaps we would centralise generation in each street. As, however, higher voltages are available the voltage adopted is usually the highest that can be safely introduced into houses

and generation is centralised for a town. Generation has been further centralised for bigger towns and contiguous groups of towns by utilising a voltage of, say, 6,600, and feeding to low-tension distribution centres, and so on up to the highest voltages at present used in this country. Overhead transmission, however, provides a further increase of possible voltage, which within practical requirements is not limited, so that generation of electrical energy need only be centralised in points affording the very best facilities as regards means of production.

To make the meaning of the above remarks perfectly clear in their application to Mr. Pearce's paper, it is obvious that to remove generation from a local site to another site some distance away is not necessarily a departure from the axiomatic rule that generation should be located at the centre of gravity of the load, any more than the centralisation of generation in such local site instead of from points in buildings or in streets is a departure from the rule.

The case of removing a generating station from the centre of gravity of a load to a more advantageous site—Mr. Pearce's Case 1 condition—is, in the writer's opinion, a special case applying to the Manchester case in point, and should not therefore be taken as a representative case against which the cost of transmission should be weighed with a view to determining economical limits of transmission for general application. In the first place it assumes that the removal is voluntary, whereas in a practical case as often as not the mere normal outgrowing of the local generating station beyond the facilities of the site may, sooner or later, make the removal to an adequate site imperative, save by refusing further load. In such case the only question is that, having been forced to move, what is the cheapest way to return, *i.e.*, to transmit back to the local utilisation point.

Moreover, the same process in more or less completed stages in neighbouring localities may enable the more advantageous site to be utilised for a super-station to generate the electrical energy required by a number of such neighbouring localities, in which case the diversity factor of such loads effects a further saving beyond that upon generation costs alone, and as such saving due to diversity factor is entirely due to centralisation, which is only possible by transmission, such further saving should be offset against the extra transmission costs, and must necessarily justify much longer transmissions than would be justified by comparing super-station generation costs, *plus* transmission costs, against local-station generation costs alone. Moreover, a site best adapted to give the best facilities for cooling water will often permit of coal being water-borne up to the site, or otherwise achieve an appreciable saving in cost of coal—in which case, as Mr. Pearce mentions, the economic distance of transmission is greatly increased. This is of such importance as to completely controvert any view that long-distance transmission is never likely to be justified on economic grounds in this country.

Then there is the case of the generation of electricity from water power. Mr. Pearce dismisses water power in this country as of very rare occurrence, but the interim report of the Water Power Resources Committee appointed by the Board of Trade shows that the water power schemes in a portion of Scotland alone are capable of supplying 1,200 million B.o.T. units per annum, which is equivalent to a quarter of the whole of the electrical energy generated by steam power stations in Great Britain. Incidentally the report goes on to say that "in consequence of modern developments of long-distance electrical transmission it would be entirely practicable to transmit the electrical energy developed at these water-power stations . . . within a radius of supply of from 80 to 85 miles," which is an interesting statement at the present juncture. The report also refers to further sources of water power in other parts of Scotland, also North Wales, the Lake District, Devon, Cornwall and elsewhere. This indicates that the possibilities in regard to the use of water power for the generation of electrical energy in this country may be of greater importance than Mr. Pearce implies, and their development will certainly justify long transmissions.

There are, therefore, many considerations, namely, diversity factor upon super-stations, reduced coal costs due to advantageous sites, water-power schemes, &c., which would justify more or less long transmissions. Hence it is of great importance to let no prejudice or other not truly founded motive unduly weigh in the choice of method.

The two possible methods available for transmission are, of course, underground cables and overhead transmission lines. The writer does not in the least depreciate the advantages of underground cables, and fully appreciates that there are many important cases when the use of underground cables is fully justified, in which cases the pre-eminence of British cable makers ensures their ability to maintain underground cable practice on the highest plane. On the other hand, there are many cases in which there is much to be said for the use of overhead lines.

Where large amounts of power have to be transmitted over more or less long distances the first requirement is high voltage. In this respect the underground cable is limited, whereas the overhead system for all practical purposes is not. Incidentally, Mr. Pearce makes the statement that with the much higher voltages that are likely to be used the great disparity in cost of overhead and underground systems largely disappears. If this were really so it might justify him in using as a basis of comparison a voltage less than the economical voltage. The writer, however, disagrees with this statement entirely, and in fact Mr. Pearce's own figures, as shown in fig. 1, disprove it.

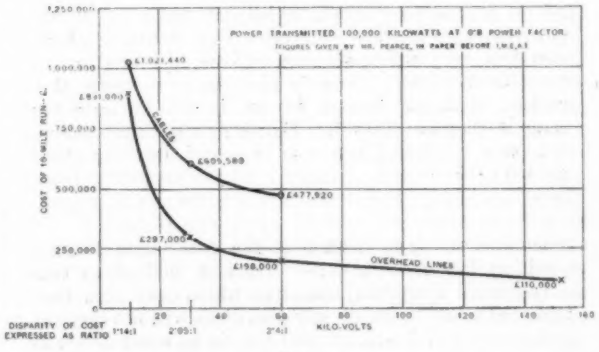

Fig. 1.

The disparity of cost between underground and overhead systems is, as shown, increasing with the voltage. This is as one would expect, as on an underground cable the extra insulation for high voltage has to be applied throughout its length at a corresponding proportional increase in cost. With an overhead line, however, the main insulation throughout its length is air, which costs nothing, whatever the voltage, and the extra insulation is only required at the points of support, *i.e.*, the insulators and pole cross arms. Hence for a given size of conductor the extra cost of an overhead line for higher voltages is comparatively small, and as the amount of power which will be transmitted will increase as the voltage the cost of transmission for such higher voltage will be reduced. On the other hand, there are factors which tend to offset a progressive saving in transmission costs with progressive increase in voltage; otherwise it would pay in every case to use the highest voltage available,

which it does not. Other things being equal how high the voltage should be, entirely depends upon the amount of power to be transmitted and the length of line.

An economic limit is always set to the height of voltage when, at any given voltage, the size of conductor necessary for the amount of power to be transmitted is already as small as can practicably be used. For comparatively small amounts of power and distances a limit is reached when the cost of step-up transformers to increase the voltage higher than a generating pressure of, say, 6,600 or 11,000 volts, offsets any saving on transmission due to increasing beyond that voltage. Then it may be necessary to have access to a length of cable as for entering a town, and with moderate amounts of power and distance it may not pay to use a higher voltage than the maximum for which a cable can be made, as thereby extra stepping-down transformers are avoided, the cost of which might offset any saving in the transmission line due to using a higher voltage. A town, however, can often be supplied from a transmission line without having to bring the main transmission into the town underground. If, for instance, the town is of a straggling nature (diagram A, fig. 2) the centre of gravity of the town load may be outside the town itself, and in other cases the town main-feeder cables can quite economically radiate from a point just outside the town (diagram B, fig. 2). In these cases an overhead line could come straight into the town main sub-station without the intervention of a length of cable, and the transmission could be at a voltage higher than a cable voltage without involving an extra down transformation.

Fig. 2.

With very large amounts of power, even though the transmission is not very long—but certainly if it is at all long—very high voltage will be economically justified, even though it should necessitate an extra stepping-down to enable the main transmission to enter a town through underground cables.

With the highest voltages the cost of switchgear and buildings to house them with the very wide clearances necessary becomes of increasing importance, and a limiting factor against which further increase in voltage has to be weighed. Generally speaking, however, it will always pay to err on the high side when deciding voltages, as thereby for a given power transmitted the current can be low, which minimises surge troubles and loss due to self-induction. This in turn economically justifies increases in the length of the transmission, or alternatively may be considered as a latent reserve against future developments of load which otherwise would over-step the economy of a lower voltage. In this country it will probably be necessary to develop voltages up to at any rate 110 kv. in order to meet the requirements of power and distance with economy. In America, of course, they have used for some time 150 kv., and are now considering the use of 220 kv., which is considered to be entirely feasible. (Note: Corona, &c., notwithstanding.) It is considered that "220 kv. is adequate for pending needs of the industry" (!) "and would afford a distinct economic advantage" in regard to "transmission of large blocks of power over considerable distances." (*Electrical World*, June 28th, 1919.)

The curve, fig. 1, shows that 60 kv. for the cases taken by Mr. Pearce is not the most economical voltage, but notwithstanding this the economy very much favours the overhead system, as the following figures given by Mr. Pearce placed side by side show:

Voltage.	Cables.	Overhead lines.	Ratio.
30,000	£1,816,740	£891,000	2·04 to 1 in favour of overhead lines.
60,000	1,433,760	594,000	2·4 to 1 ditto.

Even if the above figures on overhead lines may be "somewhat underestimated," as Mr. Pearce states, the ratio is so great that the figures for overhead lines can be materially increased and/or the price of cables materially decreased and still show a ratio very favourable towards overhead lines. Hence if the economical voltage for the condition were taken, much greater would be the economy of the overhead line as against a cable.

In view of this almost startling economy of overhead lines and the even greater economy of the higher voltages which are only possible by overhead lines, it is desirable to consider why there should be any question of their use. Unfortunately in this country a number of considerations have hitherto militated against their fullest use. In the first place, there is often a good deal of difficulty with wayleaves, local authorities' veto, complying with Post Office regulations, &c. It is hoped that as the result of present legislation most of these difficulties will be at least minimised. Apart from these real difficulties, however, there is some prejudice against overhead lines, a good deal of which is based upon wrong premises, or at any rate upon exaggeration.

The writer recently dealt with this side of the question elsewhere (*Electrician* of June 27th, 1919, "Practicability of Transmission Lines at the Highest Voltages in this Country"), and endeavoured to show, *inter alia*, that as regards climatic considerations, which Mr. Pearce refers to, there is nothing in our climate to prevent the use of a transmission line of as high voltage as may be justified. A lot of the prejudice against overhead lines is based upon the fact that the class of overhead lines which in this country are most in evidence, *i.e.*, telegraph lines, come down in storms, and this leads to the belief that if these lines come down power lines will also. There is a great deal of difference, however, between a telegraph line and an overhead transmission line, but that which most accounts for the breakdown of telegraph lines is the effect of loading on the way small wires used for telegraph purposes, and is entirely accounted for by the physical fact that as the diameter of wires is reduced the corresponding area reduces as the square. Sir William Slingo stated (contribution to paper read before Institution of Electrical Engineers, G. V. Twiss, "High-tension Overhead Transmission Lines," *I.E.E. Journal*, 1917, Vol. LV.) that in the great storm of March 27th and 28th, 1916, over £300,000 worth of damage was done to telegraph and telephone lines in this country as the result of snow and wind, but not a single wire weighing 600 lb. or more per mile (5½ s.w.g., or 0.2 in. diameter) was broken down, whereas 100 lb. to the mile wire every storm breaks down. (Note: They are all strung with the same alleged factor of safety.) If for no other reason than that they are larger, overhead transmission conductors do not come down in storms.

As regards reliability, this almost entirely depends upon the insulators. It must be admitted that in the past high-voltage transmission lines in, say, America, have been subjected to a certain amount of shutdown owing to failure of insulators. The design and manufacture of insulators has, however,

made great strides during the last few years, more especially in this country, so that transmission lines insulated with insulators of British design and English porcelain will leave little to be desired on the score of freedom from shutdown due to insulator failure.

It is sometimes stated that to ensure reliability, transmission lines should be run in duplicate by alternative routes. This duplication, however, as Mr. Pearce indicates, is equally important for underground cables, and cannot therefore be fairly offset against overhead transmission. In this respect also the question of current density on the conductors has a bearing. The current-carrying capacity of a cable of specially high voltage is limited to somewhere about 1,000 amps. per sq. in., whereas on an overhead line the heat is readily dissipated in the air, and the line can run at a much higher density. It is not, however, suggested that an overhead line should be worked at the maximum current density permissible by heat, but nevertheless in an emergency more power can always be transmitted along an overhead line at the expense of a temporarily increased loss, and this is not permissible with a cable.

As regards lightning, there are transmission lines operating in some of the worst lightning places in the world, yet engineers have not been deterred thereby, and have been able to adequately safeguard the lines. Having regard to the comparatively small amount of lightning in this country, much less therefore need we be deterred by it. Moreover, it must always be remembered that the higher the voltage the more free the transmission line is from lightning troubles. It has been found abroad that lines above about 80,000 volts are much less susceptible to lightning trouble than lines below 80,000 volts, except comparatively low-tension lines, which are also comparatively free from trouble owing to their usually being in sheltered positions. This comparative freedom of lines of over 80,000 volts from trouble is probably due to the greater margin of rise in volts before insulator failure or flash-over occurs, and also to some extent due to the fact that lines of over 80,000 volts operate at somewhere near a corona condition, and hence with any considerable increase in voltage as by a lightning or other surge a good deal of over-pressure energy is dissipated by corona. Also with voltages of 80,000 or higher suspension insulators are almost invariably used, and these are to some extent sheltered by the cross arms from which they depend. Hence from the point of view of freedom from lightning troubles it is desirable to use the higher voltages.

Certainly from æsthetic reasons a transmission line cannot compare with an underground cable which is not seen at all. A coal mine, or an iron and steel manufacturing area may not be exactly pretty, but its eminent utility far offsets any æsthetic loss, and, similarly, the use of an overhead line will often make a transmission scheme economically practicable which would not be so with the use of cables, first, because of the economy of the overhead system *per se*, and, second, because of the overhead system achieving the further economy by the use of the economical voltage which may be beyond the scope of a cable.

As against any slight disability of the overhead line, such as this æsthetic one, and apart from its main advantage of economy, it has other advantages privy only to overhead lines. One of these is the facility given to increase the power of the transmission should the demand necessitate it without any very great increase in cost. With an underground cable the only means of meeting an increased demand beyond that for which the cable is designed is by providing duplicate cables. With an overhead line, however, the voltage can be increased by merely re-winding the transformers and adding extra insulation on the line. This is especially easy when suspension insulators are used by merely adding one or more discs to the chain. This advantage is of considerable importance in this country in view of the possibility of the demand for electricity rapidly developing. Another advantage peculiar to overhead lines is the possibility of arranging sub-stations in conjunction with them on the outdoor system. The use of overhead lines goes hand in hand with sub-stations of the outdoor type, which enables further economies to be made on the sub-station as great as that on the line itself, and also permits of expansion for increasing demands at comparatively small expense. A further important point peculiar to overhead lines is that of the length of route. As Mr. Pearce states, cables should be run along well defined routes, preferably main roads, and not alongside railways or across virgin ground or ploughed fields. Overhead lines, however, can take the shortest route, whether it be alongside a road or across open country, over mountainous districts, rivers or the like, thereby effecting a further saving by shortening the route and reducing the line loss.

In view of all these points, therefore, and whilst recognising that cases must be considered on their merits and that underground cables are justified in many cases, yet there can be no doubt that there are likely to be transmission cases in this country where if economy is properly regarded the voltages necessary will be higher than any present or even anticipated cable voltages, and for these the overhead system must be used, and in respect of other transmissions at voltages within that of cables, the same regard for economy will necessitate the use of overhead lines particularly if the nature of the country or district to be traversed by such transmission line enables an overhead system to take the shorter route.

Where for these and other reasons the transmission is indicated on the overhead system, there need be no fear that such transmissions, provided they are designed and erected by engineers competent in this particular branch of engineering, will give service any less efficient or reliable than any other system.

WAGES OF EMPLOYÉS IN ELECTRICITY UNDERTAKINGS, LONDON DISTRICT.

The following is an abstract of Award No. 556, a copy of which we have received from Mr. H. H. Morton, Electrical Trades Union, London, Station Engineers No. 1 Branch. It will be remembered that the matter was referred to arbitration by the Joint Standing Conference set up as per paragraph 13 of the Committee on Production's Award No. 2,772, of November 8th, 1918.*

The claim submitted was a request for (1) interpretation of Award No. 2,772 in its application to the rates of pay of charge engineers in traction sub-stations of the L.C.C. (2) general interpretation of sub-clause XVII of clause 7 of Award No. 2,772, and (3) interpretation as to the definition of shift workers.

The matter was referred by the Ministry of Labour to the Court of Arbitration for settlement, and representatives of the parties were heard on June 13th, 1919. Award No. 2,772 was the result of a claim made by the unions concerned for new card rates and altered working conditions. Clause 8 of the award provides that the following shall be the basic rates of the grades mentioned:—

Sub-station charge engineer or attendant: Under 1,000 kw. installed, 40s. per week; under 3,000 kw. installed, 50s. per week; over 3,000 kw., 60s. per week, subject to additional 5s. per week being paid when any or all of the following conditions apply: (*a*) Sub-stations supplied from two or more generating stations in which attendants in charge have to synchronise or parallel such generating stations. (*b*) Sub-stations where the attendants in charge are responsible for the area supplied from the sub-stations and have to isolate sections of the network external to sub-stations in case any mishap occurs.

Existing Rates.—Where existing rates are better than those provided for under this award, no change shall be made.

Definition of Shift Work.—Shift workers are employés who take alternate shifts, that is "rotating shifts." They shall be regarded as weekly servants. Seven days' notice of termination of engagement shall be given by either side.

* Elec. Rev., November 22nd, 1918, pages 488-489, and December 27th, 1918, page 628.

Article 1 of the L.C.C. Tramways "Rules and Regulations for Sub-station Employés," dated May, 1910, reads as follows: (1) Each sub-station is to be in charge at all times of (*a*) a charge engineer; (*b*) a switchboard attendant.

The wages authorised by the Council, March 27th, 1903, are: (*a*) for charge engineers from £2 10s. to £3 per week; (*b*) for switchboard attendants from £1 10s. to £2 per week.

Increases of wages up to the maximum authorised rate may be granted from time to time by the chief officer on receipt of a certificate from the electrical engineer that the behaviour of the man in question has been entirely satisfactory, and that his abilities and duties warrant it.

Under these rules the miximum weekly rate for a charge engineer at a small station was 54s., and for the largest stations 60s. The men contended that the Committee on Production by its Award No. 2,772, altered the base rates, but left the merit increments undisturbed, and that, therefore, the increment pay should be added to the base rates of 55s. and 65s. a week, as it was added to the 50s. prior to the award. It was contended on behalf of the L.C.C. that the scheme in operation prior to the issue of Award 2,772, was superseded by the scheme agreed to in that award.

The award of the Court is as follows: Item (1), clause 8, of Award No. 2,772, taken in conjunction with clause 7 (XVII) of the award, deals with basic rates only and does not interfere with any agreement between employer and workmen as to increased advances above the basic rates for merit, good conduct, or other cause. Accordingly in the case of charge engineers in traction sub-stations of the L.C.C. the men who prior to the award, and then in the employ of the Council, might receive under the rules then in force wages in excess of those specified in the award (*i.e.*, who were on a scale rising above 55s. a week) continue to receive increments up to the maximum authorised by the rules if the conditions attaching to the receipt of increments are fulfilled. For instance, men who were at sub-stations, the maximum for which was 60s. per week may, so long as the rules remain in force receive increments upon 55s. per week granted under Award 2,772 for charge engineers at sub-stations between 1,000 KW. and 3,000 KW. up to the authorised maximum of 60s. per week, provided that the conditions attaching to the grant of increments are fulfilled.

Item (2), the term "existing rates" relates to rates of wages only, and does not refer to overtime or extra payments for shift work over and above the usual rates.

Item (3), shift workers are defined as being employés who take alternate shifts, that is rotating shifts, by which a man works sometimes at night and sometimes by day, or alternates on a two- or three-shift system.

The award is dated June 27th, 1919, and signed by Wm. W. Mackenzie, John M. Denny, and F. S. Button.

THE CONTROL OF INDUSTRY.

Report of the Nationalisation Committee of the Federation of British Industries.

The Publicity Department of the Federation of British Industries has issued a memorandum of the report of its Nationalisation Committee, which committee, it is claimed, was thoroughly representative of the different industries. The report is therefore offered as "the first important pronouncement on industrial policy by employers since the National Industrial Conference convened by the Prime Minister on Feb. 27th, 1919," and "it presents to the nation a constructive alternative policy to that of the 'nationalisation' of industry."

The report opens by setting forth some of the conditions under which industry is carried on, and traces the development of the industrial system during the past century. In 1800 the population of England and Wales was not much more than 8,000,000, with a low standard of living. The population increased to nearly four times that figure by the end of the nineteenth century, and the standard of living had been considerably raised. The capitalist system prevailed during that period, and, it is stated, made it possible, by its adaptability, to increase production and for wealth to increase, thus encouraging the producer to meet the needs of the consumer. By the export of manufactured goods the necessary raw materials and foodstuffs required for the country's subsistence are paid for.

The capitalist system met destructive competition by industrial combinations, thus standardising production and reducing costs, and enabling a stand to be made against foreign penetration. The combination of capital has given rise to some of the present unrest, though the report claims that the charge of exploitation of the customer or consumer has been exaggerated. There is little or no personal contact between the proprietors and the men employed in industry.

Waste of natural resources, particularly in America, has helped to give rise to dissatisfaction.

The Labour and Socialist parties have suggested as a remedy for the difficulties mentioned:—

"1. Nationalisation.

"(*a*) To prevent the possible exploitation of the consumer by the monopolies which may result from the centralisation necessary to the efficiency of certain industries and public services.

"(*b*) To supervise and co-ordinate the development of essential national resources.

"2. Democratic Control by the Workers.

"To prevent the alleged exploitation of Labour by Capital, both in regard to:—

"(*a*) Conditions of employment.

"(*b*) Division of the rewards of industry."

Nationalisation is next discussed under the alternatives of State ownership, State management, and municipal enterprise. The committee's views are set out by means of a number of general statements. State management is fatal, it says, to commercial efficiency and enterprise, and State ownership need not necessarily be accompanied by State management. The evidence of Sir Keith Price, Director of the Raw Materials Section of the Ministry of Munitions in 1918, and Deputy Director-General in 1916-17, summarised objections to bureaucratic management. These included cumbersome procedure, lack of freedom of the management in selection of and dealing with staff, lack of authority in dealing with labour, and the reluctance to the keeping up-to-date of the plant. Government departments experience difficulty in the competitive acquisition of raw material, and in marketing their products. Political pressure is brought to bear in ways which interfere with the efficient conduct of business.

These difficulties appear to the committee to be intensified under democratic government, and it looks to Germany as the example, under the Imperial system, of the highest efficiency attainable under bureaucracy.

Municipal enterprise suffers from the same disabilities, and neither the State nor municipalities can engage usefully in the production of goods for exchange. Foreign competition would give rise to further difficulties.

Certain public services, such as roads and sewers, must be publicly owned. Others, involving the exercise of arbitrary or exceptional power, are best owned by the State or municipalities. Some organisations thrive best under commissions or trustees.

Further extension of State monopolies should be avoided for these and other reasons, among which are the objection to the Government employing large numbers of voters, the impossibility of industrial impartiality, and delay in the taking of decisions.

Recommendations are made covering the State regulation of monopolies by Board of Trade tribunals, and the conservation of national resources.

Democratic control is discussed, under the headings of syndicalism, State socialism, guild socialism, co-operative production, and self-governing workshops; and recommendations are made covering the further establishment of Whitley Councils, and the consequent participation of the workers in the management of industry. They should not take any part in the commercial management. Financial and trade statistics should be supplied to them, and works committees are encouraged. Profit sharing and pooling is not considered satisfactory, and payment by results is advocated.

The function of the State in relation to industry should relate to employment conditions and the safeguarding of the public from dangers due to either side.

THE TRADE MARKS BILL.

The Bill to amend the Trade Marks Act, 1905, introduced by the President of the Board of Trade, is dealt with in the *Board of Trade Journal*, and may be briefly summarised under three heads:—

1. Proposals which provide facilities for the registration in the United Kingdom of marks which although not registerable under existing legislation are nevertheless common law marks and could be protected in the form of action known as a "passing off action."

2. Proposals for the prevention of the abuse of the word marks; such abuse consisting in the use by the trade mark owner of his word mark not for its proper purpose of distinguishing the goods of the trade mark owner from the goods of other persons, but for the purpose of giving a name to an article; and thus under the protection of the trade mark law obtaining in fact a perpetual monopoly of the manufacture of the article.

3. Minor amendments to the principal Act.

The existing Trade Marks Act defines the necessary characteristics of a registerable trade mark, and the limitations placed by this section on registration necessarily exclude a large number of marks which are and will continue to be actually used in trade and commerce. Such trade marks so far as they in fact indicate a definite proprietorship would be protected by the Common Law. Under the proposed amendment, though they will not have the special remedies accorded to trade marks under section 9 of the old Act, they will be considered as registered marks, and the registration will be regarded as *prima facie* evidence of ownership.

Clause 1 provides that for this purpose a new part of the Trade Mark Register, to be known as Part B, shall be opened wherein such marks shall be registered. Clause 2 provides for the registration of all such marks which have been *bona fide* used in the United Kingdom for a period of not less than two years. It is not intended that the Patent Office

should undertake any search in respect of these marks, but power is reserved to refuse registration of any mark. An appeal is provided from the registrar's decision to the court. Clause 3 applies certain provisions of the principal Act to the marks registerable under the new measure. These provisions are necessary to provide machinery for opposition and other proceedings before the Patent Office. Clause 4 provides that the entry of a mark in Part B of the register shall not be conclusive evidence that the owner has the exclusive right to the use of the mark, but only *prima facie* evidence, and the only powers that the owner of such a mark will have in the United Kingdom will be such powers as he would have had in a passing off action, except that the onus of proving that the mark has not been infringed has been placed upon the defendant. Clause 5 allows the registrar instead of absolutely refusing to register a mark under Part A of the register, to treat it as an application under Part B, and proceed accordingly. Clause 6 is framed to remedy the abuse of the Trade Mark Law. The name by which an article is commonly known—without any reference to its origin—is not a proper registerable trade mark, and the evils resulting from the possession of any monopoly in the name of an article, have been most conspicuous in the case of drugs. The clause deals only with the more conspicuous examples of the abuse described; the use of the name of a patented article as a trade mark after the expiration of the patent, and the use as a trade mark of the name or only practical description of a single chemical substance. Clause 7 transfers from the Board of Trade and the Court to the registrar the power to determine the distinctiveness of marks other than those referred to in paragraphs 1 to 4 of section 9 of the Trade Marks Act, 1905. The change will simplify and cheapen the procedure. Clause 8 transfers the right of appeal in matters which involve legal interpretation of the Acts from the Board of Trade to the Court. It is thought that all appeals should be made to the Court, except appeals on unopposed applications. It further gives the Court power to exercise the same discretion in dealing with cases as is now exercised by the registrar. Clause 9 gives to the registrar an original jurisdiction to rectify the register. This will enable any marks which have ceased to be used to be removed from the register. Clause 10 gives the registrar power to deal with the costs of all proceedings before him. Clause 11 makes it compulsory to register all assignments of trade marks. A similar clause appears in the Patents and Designs Bill.

The schedule deals with minor amendments which the administration of the Act of 1905 has shown to be desirable.

PATENTS AND DESIGNS BILL.

In a special article in the *Board of Trade Journal* for July 31st, 1919, an account is given of the purpose and scope of the Bill to amend the Patents and Designs Act, 1907, which has been introduced into the House of Commons by the President of the Board of Trade, and has been read a second time. It is stated that the object of granting patents for new inventions is to benefit the trade or industry of the United Kingdom. For this purpose it is not enough to reward the inventor; it is also necessary to secure that new inventions be brought into commercial use without undue delay. To bring a new invention into commercial use requires in many cases the co-operation of the capitalist, and the readiest way of securing this co-operation is a grant of a monopoly. The consideration justifying the grant of a monopoly for a new invention is not only the disclosure to the public of information which they can use when the period of the monopoly expires, but the benefit to trade by the new invention being brought into commercial use during that period. The public, therefore, are entitled to have the monopoly so framed and guarded that they are not deprived of this consideration. The real difficulty is to prevent the abuse of the patent monopoly without so restricting it as to deter the capitalist from financing the inventor.

There are therefore various conflicting interests to be considered. The inventor has to be rewarded and encouraged to exercise his inventive skill. The financier has to be induced to assist the inventor in bringing his invention into practical use, and, lastly, the public have to be protected from the abuse of the monopoly and the loss of the consideration which alone justifies the grant. The last consideration applies especially in the case of foreign patentees, where it is particularly necessary that the monopoly given by the Crown in the public interest should not be used to the detriment of national trade or national interests.

The chief abuses of the patent monopoly are summarised as follows:—

(1) Preventing the use within the Realm of the patented invention, from ulterior motives.

(2) Using the patent monopoly to encourage trade abroad and to hinder trade in the Realm.

(3) Hindering the trade in the Realm by unfairly refusing to grant licences.

Clauses 1 and 2 of the Bill are an attempt to deal with the whole question, and provide a complete and comprehensive scheme for the purpose both of encouraging early manufacture within the Realm and of preventing abuse of the patent monopoly. As regards Clause 1 the procedure under Section 24 of the Patents and Designs Act, 1907, has been found cumbrous and expensive, and has rarely been used. And as regards Section 27 the standard of comparison between British and foreign manufacture was one which it has been found difficult to work out in practice, as the necessary data were not available. Further, there are cases where the appropriate penalty is revocation, others where the appropriate remedy is a compulsory licence, and there would seem to be no reason for not allowing the tribunal to order either remedy in its discretion. It is therefore proposed in Clause 1 to replace both the sections referred to by a single clause amalgamating the procedure as far as possible for dealing with all future abuses. It must be borne in mind that inventions may be divided roughly into two classes, namely, those which do and those which do not require for their practical development the expenditure of considerable capital. In the case of some inventions capital to the extent of over £100,000 has been expended before any return has been received by the owners of the patents. On the other hand, there are many inventions which need but little capital to procure their commercial use. The new clauses are so framed that adequate discrimination in this respect can be exercised by the tribunal in determining whether in any particular case there has been an abuse of the patent monopoly. Experience has shown that revocation of a patent in the case of abuse of a patent monopoly is not always or even most frequently the best course to adopt in the interests of the realm. It would frequently be to the advantage of a foreigner that a patent—even his own patent—should be revoked if it were not being worked within the Realm; in spite of such revocation he could still import the patented article from abroad and sell it at a price which would preclude its manufacture in the United Kingdom. This would not be possible if a compulsory licence were granted, preferably to a British trader, and the licensee given power to enforce the patent monopoly. The patentee in that case will still receive his reward in the shape of royalty and a genuine British trade will be assisted. In default of agreement the terms of the licence will be settled by the Comptroller or Court on principles laid down in the Bill itself—and the Comptroller may call in an arbitrator if it appears desirable in any case.

Compulsory Licences.—Clause 1.—In the first clause (which is to be substituted for Section 27), it is proposed to provide a simple and inexpensive means of obtaining the grant of compulsory licences and the working of patented inventions. Any abuse of his patent rights by the patentee either by failure to work or to grant licences on reasonable terms wherever the public interests demand, or by unfair conditions imposed on the sale or use of the patented article, will render him liable to have his patent revoked or a compulsory licence granted on reasonable terms, wherever the latter appears to be the fairer or more appropriate remedy. The procedure for obtaining licences has been greatly simplified.

"*Licence Patents.*"—Clause 2.—In the second Clause, to be substituted for Section 24 of the Act of 1907, it is proposed that the patentee should be allowed to declare his patent to be a "licence patent," and in that case anyone who wishes may claim a licence under it as of right. This is intended as an encouragement to the commercial working of inventions and as a possible assistance to inventors who have no means of exploiting their patents themselves, or of coming into contact with those who wish to use the *invention commercially*. In default of agreement the terms of the licence are to be settled by the Comptroller or Court.

Opposing Grants of Patents.—Clause 4.—It was felt that in order to guard against the granting of invalid patents certain additional grounds of opposition might usefully be provided. This Clause provides that opposition may be filed (1) on the ground that the invention has been published prior to application in any printed document which has been published, and (2) in the case of "Convention" applications when the invention described in the specification filed in this country differs from that described in the specification filed in the country of origin, and when the additional matter forms the subject of an application made by the opponent in the interval between the leaving of the application in the foreign State and the leaving of the application in this country.

Assignments.—Clause 5.—In this Clause it is proposed to make provision for overcoming the difficulty which has arisen in some cases where the applicant has agreed in writing to assign the patent when granted to another party or joint applicant, and refuses to proceed with the application; such cases may, under this Clause, proceed at the request of the person to whom the invention has been assigned.

Term of Patents.—Clause 6.—In most other countries the term of a patent is longer than in this country. It is felt that the opportunity should now be taken of extending the term of patents to sixteen years instead of fourteen. This extension will compensate, to some extent, for any loss suffered by patentees, as such, during the period of the war.

Loss Caused by the War.—Clause 7.—This clause expressly allows the Court, in determining any application for extension of the term of a patent, to take into consideration any loss occasioned by the war. If Clause 6 be adopted all existing patents will be extended for a period of two years, and the operation of the two Clauses should be sufficient to meet all real cases of hardship. Any further general extension to meet war losses is not desirable. Losses have been universal in the war, to all classes and trades, and the effect of any

such proposal would be to single out inventors as a special class for treatment.

Use by the Government.—Clause 8.—This clause provides that if an invention which is the subject of a patent was recorded in a document, or tried by or on behalf of a Government Department, before the date of the patent and was not communicated by the applicant for the patent or patentees, the invention may be used for the services of the Crown free of any royalty or other payment to the patentee.

Patent Actions.—Clause 9.—This section is an attempt to simplify the trial of a patent action by confining it to the claim which it is alleged has been infringed, and excluding other considerations or the validity of other claims. It does not in any way alter the rights of the parties, but simplifies procedure and saves cost.

Clause 10.—This section deprives the plaintiff in an action for infringement of the right to an account of profits. It is an expensive procedure, and damages appear to be the proper and adequate remedy.

Chemical Products.—Clause 11.—This clause relates to chemical products and substances intended for food or medicine, and confines the patentee to claims for the substance as produced by the process he has discovered; and not the substance generally by whatever process it may be made.

Awarding Costs.—Clause 12.—Section 39 of the Act of 1907 gives the Comptroller power to award costs in certain cases. The new section is inserted in the "general" part of the Act, so as to make it applicable to all proceedings relating to patents and designs.

Secret Use of Inventions.—Clause 13.—Under the present wording of Section 41 (2) of the Act of 1907 it might be possible for a person to use an invention secretly for a considerable period, and when his secret was discovered or disclosed by an employé he could obtain a valid patent if he at once applied for the grant. It is felt that this is providing him with an unfair monopoly, and it is proposed that the protection afforded by this Section should not extend to cases where the invention has been worked commercially for more than six months before the publication referred to therein.

Power to Cancel Designs.—Clause 14.—This Clause has been framed to give the Comptroller power to cancel any design which has been *published* in the United Kingdom prior to the date of registration, or which is applied by manufacture to any article in a foreign country and is not so applied by manufacture in the United Kingdom.

Registration of Assignments.—Clause 16.—This Clause has been framed to make it compulsory to register any assignment at the Patent Office.

Appeals to Law Officer.—Clause 17.—This clause amends Section 75 of the Act of 1907 by definitely stating that an appeal shall lie from the Comptroller's decision under that section to the Law Officer. This amendment merely makes statutory what has been the practice for many years past.

Patent Agents.—Clause 18.—This Clause is an attempt to control those persons who are really practising as patent agents and to exclude from practice all undesirable persons.

Schedule.—The schedule of the Bill contains several minor amendments of the Act of 1907. The time for leaving a complete specification after a provisional is extended from six to nine months.

The amendment of Section 15 of the Act of 1907 gives the Comptroller power to grant a patent in lieu of a patent which has been revoked on the ground of fraud. Provision is made that where an original patent is revoked any patent of addition thereon may if so ordered become an independent patent.

The Hot-Wire Microphone.—A representative of the *Observer* recently interviewed Dr. W. H. Eccles on the subject of the hot-wire microphone, which recently came before the Royal Commission on Awards to Inventors. The device acts as a microphone by converting the alternations of an electric current into appreciable sounds. Some thermal microphones, first made by Dr. Eccles in 1906, consist of a short loop of stripped Wollaston wire in a short piece of glass quill, so shaped that it will fit into the ear. Wollaston wire has a diameter of about 0·00024 in., and is made by coating very fine platinum wire with silver, and then drawing it out, after which the silver is dissolved off. The apparatus is attached to the telephone wires in the same way as the ordinary receiver. When a small current is passed through the loop, the wire is heated, and on the current being cut off it cools. This process takes place at the rate of about 100 times per second, and the alternate heating and cooling sets up an air pulse which affects the drum of the ear, and is perceived as sound. About the same year the same devices were also being made by Gwodz, of Lodz. In France, de Lange went so far as to put them on the market, and they have also been produced by a Dutch and a German company. Dr. Eccles does not think they would ever be a commercial success; they are cheap, but liable to burn out, and no particular advantage is attached to them. According to Dr. Eccles, Major Tucker's apparatus differs from that described above. It consists of thin wires arranged in the neck of a bottle, and heated by a small current. Waves set up by the explosion of distant guns cause air to flow over the wires, which cools them so that they contract. Two such devices are placed at different points, and the gun is located by triangulation. Dr. Eccles does not, however, see how the device can be of any use in telephony.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

The Compilation of Trade Publications.

I have read with great interest the article by Mr. E. Austen appearing in your issue of the 8th inst., as this is a subject to which I have devoted considerable study.

British engineering advertising and publicity methods are undoubtedly improving gradually, but they are still immeasurably behind pre-war German and present-day American methods. It is becoming increasingly recognised that British trade—especially overseas trade—has suffered much in the past, and is still suffering to-day, on this account.

Recently I had placed in my hands a letter written by an enthusiastic Britisher in Australia commending a certain effort of British co-operative publicity, in which the writer stated that in Australia to-day, American practice and specifications are being adopted in preference to British, simply because they are more widely known. This, of course, is not a new statement by any means—the pity of it is that it should have been made in various forms so often, and concerning so many of our markets abroad, without a corresponding improvement in our methods.

So far as those British engineering firms are concerned who are sufficiently large to organise and maintain their own publicity department, the problem becomes more or less an individual one; but in the case of the smaller (but still important) manufacturers, I believe that co-operative effort is the solution.

Now, co-operative effort is a theme which can be discussed and written about almost without limitation. It is literally bristling with advantages and logical conclusions; but because, perhaps, of the psychology of the British race, little practical accomplishment has been made in the direction of co-operative publicity.

At the present time, however, various members of the B.E.A.M.A. are engaged in producing a co-operative booklet dealing with electrical development in Great Britain, in connection with the Athens Exhibition, which booklet I am editing.

It is hoped that when this is received from the printers it will represent a practical accomplishment which will help manufacturers to realise more clearly the immense possibilities of co-operative publicity methods, and I hope you will find space in your columns to review the book, and give it the wide publicity which the effort undoubtedly deserves.

It would be particularly interesting to me, and I believe to a large number of your readers at the present time, to learn the views of various members of the profession on this subject of co-operative publicity work; and if you could, therefore, keep your "Correspondence" columns open for a short period for a discussion on this subject, I think it would prove of universal benefit.

P. W. Laverick.

London, *August 11th*, 1919.

L.C.C. Tramways Electrical Staff.

Having read "Jonah's" letter in the last issue of the ELECTRICAL REVIEW, on the above staff, I cannot help but think it is a great pity, to say the least of it, that the writer of such letters cannot have some thought for other men before airing his own personal views in the Press, when the indirect outcome of such comment may have harmful results to many. I should point out that for many years there was discontent amongst the station staff of the L.C.C.T., because outsiders were brought in to fill certain posts on the electrical staff, when these could easily have been filled by men employed on the station staff, who were quite capable and fitted for better jobs should they be given the chance. This has now been altered, as we see by the appointment of certain station employés to better positions. I take it that "Jonah" is or has been employed by the L.C.C., seeing that he has all the facts and figures; in any case, being in the know as he is, I have no doubt he will be aware of the difficulty to get away from substation work. Perhaps it may be that he has been disappointed in trying so to do. Does our friend "Jonah" wish to revert to the days when the outsider took these posts without doing the donkey work underneath? If not, why criticise the sub-station man who manages to get a better job? However, the valuable "Correspondence" column of the REVIEW is not the place to alter these things, but a great deal of good or harm might be done through it. Why not use it for the best purpose? I believe I am right when I say that a very big majority of the station employés are in favour of keeping these better jobs on the job; and I hope for the sake of all this will be done, remembering that we cannot all get one job. But let us be sportsmen, and know how to lose as well as to win.

E. W. Jones.

London, S.E., *August 10th*, 1919.

The letter by your correspondent "Jonah" (should it not have been "Sour Grapes"?), is typical of the disgruntled type who are quite willing to wound, but afraid to strike. One might conclude that he was a modern Diogenes, or a heaven-sent deliverer to purge the Augean stable. He might with advantage digest the motto, *Vincit qui se vincit*. The method of his attack is commonly known as hitting below the belt, inasmuch as he is serenely secure in the knowledge that he is immune from

retaliation from the persons attacked, who by virtue of occupying office as public officials are precluded from justifying their position, even should they deem it necessary. While not desiring to take up the cudgels on behalf of any official, public or otherwise—and in fact it has been my duty on many occasions to deal contentiously with both—I certainly object to "Jonah's" methods, as they are not only used as a weapon against employers' representatives, but also against employés' representatives, and in the same manner, *i.e.*, by innuendo. An analysis of "Jonah's" complaints disproves their substance, he states :—

1. That an electrical engineer was appointed at £1,500 per annum, who in the supply branch of the industry was an unknown man.

This statement at once disproves "Jonah's" ability to discuss our industry at all, unless he has Rip van Winkled for the past 20 years, as this particular engineer was known, and well known, as a member of one of the foremost consulting engineers in our industry at least 20 years ago. The position is one in which he will have to advise and supervise primarily in the purchase and lay-out of power plant and switchgear; one cannot imagine exactly what sort of a person "Jonah" would consider suitable unless it is, perhaps, a pork butcher.

2. Since the appointment many new offices have been created and filled . . . most probably with the object of making a safe road for the convenient man.

Here, perhaps, is the crux of the whole complaint, and one can at once conclude that "Jonah" is not one of the convenient men, or, perhaps, he has been too convenient.

3. Further, the job is eminently simple in character.

This will come as a shock to the budding Faradays, who for years, with varying degrees of success, have wobbled slide rules, plotted curves, and swallowed logs, in anticipation of someday knowing exactly what does make the "wheels go round" in this eminently simple plant, forgetting that theory is only a portion of the knowledge requisite to qualify for an administrative post.

4. He deplores that a man who was receiving £2 16s. per week should now receive £200-£250 per annum.

This places the true character of "Jonah" right in the limelight, and betrays a meanness of spirit and narrowness of perspective typical of the individual who, when at a branch meeting, would be the first to demand "That the rank and file should have a chance." Further, such an observation shows crass ignorance of our industry, as many men are considerably in advance in knowledge and experience of the positions they occupy, but are merely victims of the circumstance of an overflooded market, and it may interest "Jonah" to know that these promotions are the outcome of a proper formulated claim made by the Union, which was agreed to by the management, to open up opportunities to the employés.

"Jonah" is evidently a fair sample of the individuals who would not join the Union in case it might, to use their own expression, "Prejudice my promotion"; although what their qualifications other than this were, nobody but themselves knew, and having learned that this qualification did not carry any weight with the powers that be, and realising that the "Facing-both-ways" tactics had miserably failed, they join the Union in double quick time, and at once commence a campaign of personal invective against the employers; and when they find that a Trade Union is not a libelling organisation, and that the members are not buying their wares, they immediately reverse their tactics, and accuse the members who have carried on constitutionally of being mere "Boss-Props," &c. Fortunately, the average Trade Unionist can measure the type, and assess them at their real value. If any advice of mine is acceptable to "Jonah," I would recommend him to put his grievances forward in a constitutional manner and through the recognised channel, and if the grievances are real he will receive every support. But if he anticipates support in the tactics adopted in his letter, it will be much better for him to remain in his present obscurity.

H. H. M.

London, *August 11th*, 1919.

Berners v. C. A. Vandervell & Co., Ltd.

With reference to this action I should like to state that I was not supported in any way by any organisation. The whole case was fought at my own expense, and the only reason why I have not entered an appeal is due to my financial position preventing me.

F. D. Berners.

Bedford Park, W. 4.
August 12th, 1919.

The Manufacture of Explosives. — Lecturing on "Explosives" at the British Scientific Products Exhibition, on July 18th, Mr. James Young mentioned that ammonium perchlorate, the chief constituent of blastine, was now made by electrolytic processes, and this explosive had a promising future in industry. In view of the dependence of our industries on national security, and of the latter on an adequate supply of explosives, the manufacture of explosives was a "master-key" industry, and should be carried on with home products. Nitrates were essential for this purpose; hitherto they had been imported, but it was urgently necessary to establish a great national factory for the fixation of nitrogen in this country. In peace time the output of the factory could be used as a fertiliser and for industrial explosives.

BRITISH SCIENTIFIC PRODUCTS EXHIBITION.

(*Continued from page* 190.)

The Aeronautical Inspection Department, of which Brig.-Gen. Bagnall-Wild, C.M.G., C.B.E., is director, sent in all the exhibits in the aircraft section. The collection would probably have been more complete if individual manufacturers had exhibited their own products; as it was it formed a fairly representative collection of materials for aircraft construction, instruments, equipment, testing apparatus, &c. Metal construction of aircraft was represented by spars and complete wings, mostly composed of thin strips of high-tensile steel, and designed by several firms. Several samples of spars were shown, some of which are said to be 15 per cent. lighter and 60 per cent. stronger than wooden spars. Among the steel spar exhibits instances of electric strip and spot welding could be seen. The extensive collection of materials, parts, and accessories for aeroplane engines shown included magnetos and parts, electric starters, generators, &c., and the casting of magneto spindles in a special bronze by Heywood Foundries, Ltd., of Seaton Street, N.W., was illustrated. The wireless apparatus shown included a complete transmitting and receiving installation for use on aero- or seaplanes. A 2.5-kw. transmitter, with H.T. alternator, used on heavy seaplanes, was also on view, as well as a number of small spark transmitters, air-screw driven generators, continuous-wave transmitters, aircraft receivers, amplifiers, wavemeters, and wireless telephone apparatus. There was also a continuous-wave set with a 1.6 H.P. motor and a 1-kw., 2,000-volt generator and switchboard, for use on ground stations. Among the accessories a cartridge aerial for use on aircraft was exhibited, which consists of a flexible copper wire coiled inside a lead weight, from which one end of the wire extends a short distance, and terminates in a lead button. The latter fits into a hook which slides in guides mounted on an ebonite base-plate, the hook being connected to a terminal by means of a spring. When the apparatus is required for use the lead weight is thrown overboard, and the flexible wire thus pulled out, is left suspended from the hook. Connection to the terminal is effected through the spring, which also absorbs the shock. When finished with, the aerial can be detached from the hook and jettisoned or recovered according to circumstances.

In brief, the function of a turn indicator is to give the pilot a larger and more immediate indication of a turn of course than would be given by his compass. The trend of development on this subject is towards the employment of an entirely new principle, namely, the precision of a gyroscope which is rigidly restrained on one of its axes. In the experimental type shown first the gyroscope was driven by means of a simple 3-phase induction motor; in the second form it was driven by an air screw, and in the third type under investigation the spokes of the gyroscope are formed as an air screw which is placed in the slipstream and thereby caused to rotate.

In view of the advantage to the pilot of having the revolution indicator before him on his dashboard, the trend of development is towards an electric indicator. This consists of a small permanent-magnet D.C. generator conveniently coupled to the engine, and connected through the medium of a cable to a moving-coil voltmeter on the dashboard. The meter is calibrated in revolutions per minute, and is damped by oil immersion, a flexible capsule being provided to permit of variation in the volume of oil under conditions of varying temperature. We also noticed a collection of X-ray photographs showing defects in timber parts of aeroplanes.

The Rapid Magnetting Machine Co., Ltd., 18, Crescent, Birmingham, exhibited an electro-magnetic ore separator, Thompson-Davies patent, which was exhibited last year, and described in our pages at the time. The exhibit consisted of a separator together with samples of minerals separated thereby, together with samples of the same minerals before separation. Loose iron can be separated by electro-magnetic machines from all classes of material, and an exhibit showed the separation of iron from brass turnings.

Thermit, Ltd., 675, Commercial Road, London, E. 14.—This firm is the owner of the Alumino-Thermit patents, and the original manufacturer of Thermit and Thermit products in this country. These compounds comprise carbon-free metals and alloys used in the production of high-speed steel, brass, bronze, cupro-nickel, &c., and are, *inter alia*, applied by the company in its system of welding. The exhibit was divided into three main sections, viz., pure carbon-free metals and alloys; samples of Thermit compounds, with explanations of their uses; and the Thermit process of welding, together with samples of welding materials and actual welds, showing cut sections.

Schall & Son, 71-75, New Cavendish Street, London, W. 1, exhibited electro-medical and X-ray appliances; the former consisted of faradic and galvanic batteries, instruments for cautery operations, and lamps for the illumination of cavities in the body, and for surgical operations, together with a number of switchboards and tables arranged to convert the main supply current to a suitable form for electro-therapeutic work. The pantostat is a machine which operates on the main current, and supplies currents suitable for cautery, light, galvanism, and faradism, whilst it also furnishes power to

drive pumps, drills, and massage apparatus. As regards X-ray apparatus, a complete outfit with 12-in. coil, a centrifugal mercury interrupter, and a trolley switchboard, all mounted on an oak cabinet were shown. Various accessories completed the exhibit.

Messrs. Elliott Bros. (London), Ltd., Lewisham, S.E.14, exhibited jointly with the B.E.A.M.A., and the construction of the complete gyro unit for precision instruments was shown. The gyroscope spins continuously at 20,000 R.P.M., with a peripheral speed of 430 ft. per second or 300 M.P.H.; it is driven by 3-phase currents of 333 cycles, at 120 volts, 0.45 ampere in each phase. Extreme care had to be exercised in the selection of materials and construction. The spindle is of the Laval type and all one with the body of the rotor, and the bearing balls had to be specially selected. The hardened steel sleeves on the taper ends of the rotor spindle have a taper of 0.006 in. in a length of 0.37 in., and the top thrust works up against a steel ball and spring. The stator had to be wound by hand and placed dead in the centre of the gyro case.

The Dubilier Condenser Co., Ltd., Ducon Works, Goldhawk Road, Shepherd's Bush, London, W.12, exhibited condensers of all types, but the speciality of the firm is the high-grade mica condensers for up to 250,000 volts for either A.C. or D.C., the superior mica and metal foil being built up by a special process. Condensers for artificial cables, fixed valve, metal plate air dielectric or oil immersed condensers; high- or low-voltage variable condensers, as well as precision variable condensers for laboratory use were also shown. Brass or magnesium-zinc alloy is the metal used in the variable air condensers, and the cases are made of ebonite or metal, as wood is liable to fail in tropical climates.

Dictograph Telephones, Ltd., Dictograph House, Denman Street, London, S.E.11, exhibited the loud-speaking telephones for house or office use, which enable a person to talk or listen to a person or several persons in an average sized room. Neither the speaker nor the listener need come up to the instrument, nor apply a receiver to his ear; an ear piece is used in the ordinary manner when privacy is desired, the other loud-speaking telephone being then cut out. The apparatus is worked by batteries or dry cells. The "junior dictograph" has been designed for installation in cases where the larger system would not be justified. It gives the same privileges to the user with the exception that communications are not secret. The motor dictograph is a telephone designed for use in motor cars to replace the insanitary speaking tube. With the device instructions can be given to the driver without raising the voice; conversation inside the car cannot be overheard by the driver, and the apparatus is easily installed.

Messrs. Stuart & Moore, Packington Road, Acton, W.3, exhibit consisted of a street fire alarm transmitter mounted in the head of an alarm post, with the door and instrument plate open, showing the pendulum contact mechanism used for distinguishing between genuine calls or otherwise. Fire station switchboard relays and fire alarm push boxes were also shown as well as rainproof and iron-cased bells; the latter withstand heat and steam. Water-tight, hand-combination telephones in aluminium cases, which may be submerged in water for long periods without harmful result, were also on view. Aluminium alloy bell gongs which, it is claimed, will give a sound far more penetrating than any bell metal hitherto used, and various standard types of telegraph instruments were also exhibited.

Messrs Isenthal & Co., Ltd., exhibited a selection of the latest post-war types of resistances with slider regulation for use in connection with the regulation of electric circuits generally. The exhibit comprised universal and double types of slate resistances; four different types of single slate rheostats with spindle and hand motion, and large tubular twin and single tube types, both with spindle operated slides. Three specimens of a new type of tube resistance, two types of "back-o-board" rheostats, and a new ventilated high-voltage rheostat were also shown, as well as a selection of strip units, and one specimen each of the "step-by-step" open-spiral resistance of the small hand-operated type, and one of the large potentiometer double-spindle operated type.

Messrs. Vickers, Ltd., Broadway, Westminster, S.W.1, had a stand facing the entrance, and the exhibit comprised engineers' small tools, plug screw gauges, railway materials, drop forgings, alloy and tool steels. There was also a selection of single, twin, 4, 6 and 8-cylinder "Blic" magnetos and component parts on view, as well as a few electrical accessories, such as domestic utensils, irons, and fans, and some porcelain electric insulators.

(To be continued.)

Patent Office Examiners.—In the *London Gazette* of July 18th particulars were given of the Temporary (Reconstruction) Regulations for the Selection of Assistant Examiners in the Patent Office. Age must be between 20 and 30; candidates must be British born, and must have served in the Naval, Military, or Air Forces. A University degree with Honours in Natural Science or Engineering, or equivalent ability, is desirable. Preference will be given to disabled men. A qualifying examination must be passed, including science subjects. Particulars can be obtained from the Secretary, Civil Service Commission, 6, Burlington Gardens, W.1.

BUSINESS NOTES.

The Industrial Conference.—In Parliament, last week, in reply to a question, Sir R. Horne said he hoped to introduce a Bill dealing with the recommendations of the Industrial Conference in regard to wages and the 48-hours week before the Recess. He understood that employers and Trade Unions would then proceed to constitute their respective sides on the National Industrial Council.

Engineers' Wages.—A Manchester paper stated last week that branches of the Amalgamated Society of Engineers were pressing the Executive Council to enforce the demand for a 15s. a week advance. Their wages were now £3 7s. 6d. a week, plus 12 per cent., and if the 15s. were conceded they would get more than £4 10s. a week.

Trade with Hungary.—In view of the raising of the blockade, the Board of Trade have issued a General Licence under the Trading with the Enemy Legislation authorising, with certain reservations, the resumption of trade with Hungary. The licence does not remove the existing restrictions upon the payment of debts and the return of property due or deliverable to persons in Hungary in respect of pre-war transactions. Moreover, any permission which may be necessary in respect of any transactions under Defence of the Realm Regulation 41D must be obtained from the Treasury. The licence does not permit the importation from Hungary of any goods included in the Prohibition of Import Proclamations, and not covered by a general licence issued under those Proclamations. Further, export licences must be obtained from the Export Licence Department, 1, Queen Anne's Gate Buildings, Westminster, S.W.1, before goods included in lists "A" and "B" of prohibited exports are shipped to those countries. But no licences are now required in respect of goods included in List "C."

Exports to Poland.—The Board of Trade announce that the Supreme Economic Council in Paris have decided to withdraw the Relief Mission in September, and that in consequence the British Relief Administration will not now be remaining in Danzic for any length of time. In these circumstances it is advisable that traders should proceed without delay to make their own arrangements for the forwarding of goods to Poland, although for the time being they may continue to consign them to the Relief Administration. They are, however, no longer required to do so.

Dedication of Ashton Park.—Ashton Park, Preston, containing over 100 acres, was on Saturday, August 2nd, dedicated by the English Electric Co. in memory of 160 employés at Messrs. Dick, Kerr & Co.'s works who fell in the war. Sir Charles Ellis opened the proceedings, and mentioned that during the war the firm had produced 3,300,000 projectiles, utilising 94,000 tons of steel, 1,900 tons of copper, and 15,000 tons of lead. Some 100 petrol-electric locomotives were made for use in France, and 64 seaplanes. A considerable sum had been raised for war charities, including £1,486 by the Dick, Kerr Ladies' F.C. and £1,300 by the Minstrel Troupe.

Government Stocks of Non-Ferrous Materials.—The following particulars are published of the stocks (exclusive of old metal and scrap) in this country in possession of the Minister of Munitions on August 1st, 1919:—

August 1st, 1919.

Copper	37,220 tons.
Spelter, G.O.B.	23,168 ,,
Spelter, refined	12,126 ,,
Aluminium	10,500 ,,
Soft pig lead	108,010 ,,
Nickel	2,454 ,,
Antimony, regulus	4,411 ,,

Foreign Trade.—The July Figures.—The following are the electrical and machinery figures given in the official returns of imports and exports for July:—

	July, 1919.	*Inc. or dec.*	*7 months*, 1919. *Inc. or dec.*
Imports.	£	£	£
Electrical goods, &c.	100,289	− 16,584	+ 134,796
Machinery	1,317,799	+ 467,408	+ 2,505,305
Exports.			
Electrical goods	544,014	+ 383,011	+ 1,486,035
Machinery	2,802,217	+1,365,529	+ 5,515,503

The Austrian Siemens-Schuckert Co.—This company, which realised net profits of £133,000 in 1917, and paid a dividend of 7 per cent., terminated the past year with a slight loss. The directors' report states that, owing to the political revolution, the company's market fell into ruins, the output of the workmen declined, and the financial charges enormously increased. No improvement in the conditions has taken place in the first half of 1919; the great schemes which were to bring German Austria considerable work are still far from realisation, and the spirit of enterprise is greatly hampered through the obscurity of the general economic situation. In addition, there is the uncertainty which arises for the company from the debts on contracts executed for the late war authorities, the holding of war loans, and the prejudice to the company's property in Hungary. Nevertheless, the directors express the hope that the undertaking may be restored to the prosperity which corresponds to its efficiency.

Applications for British Trade-Marks.—Appended is a summary of the recent applications for British trade-marks in respect of productions connected with the electrical industries :—

Kortex, No. 390,184, Class 50.—Insulating preparations (electrical) of asbestos, mica, resin, oils, or bitumen, Lewis C. Firth, 15, Cross Street, Manchester, April 15th, 1919.

Magneto design, combined with words "trade-mark," No. 390,931, Class 6.—Machinery of all kinds, Runbacken Magneto Co., Ltd., Cheetwood Lane, Machester, May 7th, 1919.

Motomaid, No. 387,596, Class 6.—Electric, hand or power-driven vacuum cleaners, Electric Appliances Co., Ltd., 8, Fisher Street, Southampton Row, London, W.C., January 15th, 1919.

Northwind, No. 392,185, Class 6.—Electric fans, fan motors, and fan frames, Emerson Electric Manufacturing Co., 2,024, Washington Avenue, St. Louis, U.S.A., June 11th, 1918.

A.W.P. (letters combined with design), No. 391,458, Class 13 — Electrodes composed mainly of ordinary metal for welding purposes, &c., Alloy Welding Processes, Ltd., 14-16, Church Street, Islington, May 21st, 1919.

Draka (word combined with design), No. 391,313, Class 8.—Electric cables, Naamlooze Vennootschap Hollandsche Draad en Kabelfabriek, Amsterdam, May 16th, 1919.

Electag, No. 389,211, Class 11.—Electric batteries (medical) and induction coils for medical purposes, and electric appliances for surgical or curative use, Thomas H. Hellyar, trading as Electrical Agencies, 21, Woodstock Street, Oxford Street, London, W., March 14th, 1919.

Nofa, No. 391,228, Class 50.—Articles for electric insulation, Naamlooze Vennootschap Nederlandsche Maatschappij tot Exploite van Optimietfabrieken, Amsterdam, May 14th, 1919.

Mac, No. 389,611, Class 13.—Sparking plugs, Wm. A. Jones, trading as the Mechanical Accessories Co., Oak Street Works, Preston, March 27th, 1919.

Maco, No. 389,612, Class 13.—Sparking plugs, Wm. A. Jones, trading as the Mechanical Accessories Co., Oak Street Works, Preston, March 27th, 1919.

Japanese Materials in the East Indies.—The directors of the Alg. Ned.-Indische Electricitcit Mij., whose annual meeting has just been held at Amsterdam, mention in their annual report that communication between the Dutch East Indies, and Europe, and America, in so far as concerned the delivery of materials was interrupted during the greater part of 1918. It had been possible, however, to procure the most necessary materials from Japan. The company has declared a dividend of 7 per cent. on the ordinary shares, being the same rate as in 1917.

Aluminium Production in Germany.—According to a German statement, that country is now independent of foreign supplies of aluminium as a result of the various works which have been established during the course of the war. Prior to the outbreak of hostilities, only one works for the production of this metal existed in Germany, namely, at Rheinfelden, Baden, this being a subsidiary of the Aluminium Industry Co., of Neuhausen. The output of this works was only 800 tons per annum, whereas about 20 times this quantity had to be imported to meet the requirements of Germany. The erection of several other works was projected in 1915, and these are said to have soon been completed, the most important being the Eritwerk A.G. at Grevenbroich, on the left bank of the Rhine.

The Old Firm.—A company has just been registered at Danzic, under the title of the A.E.G. Elektricitäts A.G., with a share capital of 300,000 marks (£15,000). The company is to make machines and apparatus of the types produced by the Berlin A.E.G.

Employment of Ex-Officers.—An Ex-Officers' Employment Bureau (in conjunction with the Chambers of Commerce of the United Kingdom) has offices at Dashwood House, E.C. 2. It is a voluntary organisation, and appeals to employers, through our advertising pages, to forward details of vacancies.

Trade Announcements.—In order to the more adequately deal with impending developments of high and low-tension overhead transmission and distribution work, a consolidation of interests has been arranged between the Twiss Engineering and Electric Transmission, Ltd., and Messrs. J. B. Saunders & Co., Ltd., and Mr. Sydney G. Leech joins the Board of the Twiss Co. and Mr. G. V. Twiss becomes a director of Messrs. Saunders. The facilities already possessed by the Twiss Co. with regard to designing and manufacturing transmission-line material and equipment will thus be augmented by the extensive contracting, erecting and maintaining, experience and organisation of Messrs. Saunders, so that the companies can supply overhead transmission lines for extra-high or low-tension erected complete in every detail. Each company will maintain its own individuality, and inquiries for transmission-line material and equipment should be sent, as hitherto, to Twiss Engineering and Electric Transmission, Ltd., at 62-63, Queen Street, E.C. 4, London ; but inquiries for transmission lines erected complete may be sent either to the Twiss Co. or to Messrs. J. B. Saunders & Co., Ltd., at Cromwell House, 6-9, Surrey Street, Strand, W.C., London, when, in either case, the same joint service will be rendered.

MR. C. J. ELTON and MR. WILLIAM CRAWFORD (partners of Messrs. Kilburn, Brown & Co.), together with MR. J. SCRIVENER, commercial manager, and CAPT. S. R. MULLARD, M.B.E., A.M.I.E.E., works manager, have been appointed directors of the "Z" Electric Lamp Manufacturing Co., Ltd., Messrs. Kilburn, Brown & Co. continuing to act as secretaries of the company. The management of the company has for some time been conducted with the co-operation of the gentlemen now forming the Board. We understand that the past year's trading has been particularly successful. The company's programme for the future is on an extensive scale, arrangements having been made for increased output to meet the expanding demand for their "Z" drawn-wire lamps, and the General Supply Section is to be greatly augmented by new lines and increased stocks.

MESSRS. P. W. PENTY & R. MARGETTS have resigned their positions on the staff of the Bradford Dyers' Association's electrical department, and have taken premises at 17, Ivegate, Bradford, to carry on the business of electrical and mechanical engineers. They desire to receive catalogues from electrical manufacturers and factors, especially of plant, switchgear, &c., for chemical and dyeworks installations.

MESSRS. ARNOLD & SONS, of Standard Works, Lawrence Road, Tottenham, N. 15, announce that as war contracts are closing they are in a position to undertake machine shop work, tool-making, scientific instrument work, electro-plating, and other such work for other firms.

MR. HENRY ADAM, having been discharged from the Army, has recommenced business at the Electric Works and Garage, Annfield Plain. Catalogues of lighting and power accessories are asked for.

THE SIGNAL ELECTRIC CO., LTD., of Norfolk House, Laurence Pountney Hill, Cannon Street, E.C., has been formed for the purpose of manufacturing signal and other electrical apparatus—such as telephones, bells, indicators, dry cells, wireless sets, &c. The company desires to receive trade catalogues.

Owing to increased trade, the LONDON ELECTRIC FIRM have taken larger offices and stores at Fulwood House, High Holborn, W.C. 1, where they will carry much larger stocks. Telephone (unaltered), "Holborn 4862."

Owing to the difficulty of meeting the demand for their "Westool" portable electric drills and other tools with their present facilities, the WESTMINSTER TOOL AND ELECTRIC CO. are erecting new works at Putney, where their head office will be. All communications intended for the head office or works, should therefore be addressed :—Westool Works, 116, Putney Bridge Road, London, S.W. 15. New telephone No. "Putney 1179." Telegraphic address :—"Westolelco-Put, London."

MESSRS. SCHOFIELD & KENDALL, cinematograph and electrical apparatus makers, have opened premises at 483, Manchester Road, Bradford.

EX-CAPT. W. PALMER and EX-SERGT. J. E. RILEY have commenced business as electrical engineers, under the style of Messrs. Palmer, Riley & Co., at Market Chambers, Blackburn Road, Accrington.

A Danish Cable Factory.—During the early part of the war certain interests in Denmark reached the conclusion that if they did not very soon proceed with the formation of a native cable-making company, foreign firms might be disposed to start manufacturing branches in Denmark, and thus check any Danish prospects in this direction. It was with the object of counteracting any movements in this respect that the A. S. Den Danske Kabelfabrik was formed in the autumn of 1916 exclusively with Danish capital, and a year later the factory and administrative buildings had been built and were ready for use at Fredericksholms haven, Copenhagen. At the end of 1917 it was found possible to inaugurate working in the wire-drawing mill both with copper and steel, but full activity was out of the question, as some of the machinery which had been ordered in America was still outstanding. Under these circumstances, the directors decided to construct this machinery on their own account, and this problem is declared to have been satisfactorily solved with the co-operation of Danish engineering firms. The managing director is reported to have opened up connections with important firms in England and America on the occasion of his visits to these countries in 1917 and 1918.

A Dutch Manufacturing Co.—The report of the directors of the Hengelosche Elektrische en Mechanische Apparaten Fabriek, of Hengelo, dealing with the year 1918-19, states that notwithstanding the co-operation of various factors which continued to offer difficulties in working, the gross profits realised were the highest on record. The stagnation produced in November through the end of the state of war, brought about a considerable decline in the company's prices ; orders in prospect were postponed, and other orders were cancelled. Since the beginning of the new financial year, however, a considerable improvement in conditions had taken place ; raw materials were now being supplied in plenty, and the works could again be carried on with full activity. The demand had also increased, and sales could be effected at profitable prices. After setting aside £86,000 for depreciation the net profits in 1918-19 amounted to £36,000, as against £102,000, and the dividend is at the rate of 8 per cent. on share capital of £250,000, this comparing with 18 per cent. on £187,000 in 1917-18.

Proposed Amalgamation of Engineering Unions.—The *Birmingham Post* stated last week that engineering and other Trade Unions have before them a scheme for amalgamation under the title of the Amalgamated Engineering Union. A ballot is about to be taken. The A.S.E. and the Electrical Trades Union are concerned in the scheme.

According to later information in the Manchester *Daily Dispatch*, the movement is still wider in its ambitions, for the A.S.E. have selected three of their working members, Messrs. J. C. Little, George Spence, and T. Newall, to visit Canada and America, along with a representative of the Executive Council, for the purpose of negotiating a scheme of amalgamation with engineers on the other side of the Atlantic.

Italian Electrical Companies.—There has been formed at Catania, with a capital of 100,000 lire, the Elettron-Studio Tecnico Ingegneria Industriale Giacomo d'Angelo e Ca., for the exploiting of the electrical industry in all its applications.

With a capital of 1,300,000 lire there has been recently formed at l'Salcito, the Società Anonima per Impianti Elettrici, for the production and distribution of electric current for lighting and industrial purposes.

There has been established at Spezia, the Officine Elettro-Meccaniche Baldrini e Ca., for the construction of locomotors and the Baldrini patent meters. The capital of the concern is 120,000 lire.

Ing. Q. sel Martino e Ca. is the style of a newly-formed company, with a capital of 50,000 lire, for constructional materials and electric representation.

The Fabbrica Apparati Telefonici Materiali Elettrici has been formed at Rome, with a capital of 2,000,000 lire, for the manufacture of the articles named in its title.

The Società Idro-elettrica Piemontese, of Turin, has increased its capital from 15,000,000 lire to 40,000,000 lire, with a view to acquiring the majority of the shares of the Società Piemontese, and the Società Piemonte Centrale di Elettricità, in order to realise its programme of extensions in the provinces of Piedmonte and Alessandria.

The Società Industria Elettrotecnica Ing. Pietro Coletti e Ca. has been formed at Milan, with a capital of 100,000 lire, to take over the business of the firm of Ing. Pietro Coletti, Reboglio, Cavinato e Ca.

Under the title of Caitiera Valvassori Valle di Lanzo has been constituted at Turin a company with a capital of 5,000,000 lire, for the generation and sale of electric current for every use.

The Società Anonima delle Tramvie Elettriche della Provincia di Salerno has written down its original capital of 3,500,000 lire to 1,750,000, and augmented its capital to 4,500,000 lire.

The Società Anonima Rigenerazione Lampade Elettriche has increased its capital to 1,000,000 lire.

The Società Anonima per l'utilizzazione delle Forze idrauliche della Dalmazia (Kerka), whose seat is at Trieste, has decided to increase its capital from 14,000,000 crowns to 21,000,000 crowns.

Owing to services rendered to the Government during the war, the Società Sicula per Imprese Elettriche, of Palermo, closes its last working year with considerable loss, which may, says *l'Elettrotecnica*, eventuate in its liquidation. It has been seven years in existence. It is proposed to transform its present steam installation to hydroelectric.

Catalogues and Lists.—Sun Electrical Co., Ltd., 57-59, Neal Street, Long Acre, London, W.C. 2.—Eight-page illustrated list giving particulars and prices of standard electrical conduit and conduit fittings; also a leaflet describing and pricing (for the trade) the Xcel electric iron, a new and entirely British-made line; a folder, also issued relating to this iron, has been prepared for the electrical contractor and retailer for distribution to the general public.

Mr. C. Orgel, 111, Great Eastern Street, London, E.C. 2.—Net trade price leaflet of electrical accessories.

Enterprise Manufacturing Co., Gun Street Electrical Works, Bishopsgate, London, E. 1.—Stock price sheet of conduit fittings.

The Vaughan Crane Co., Ltd., Openshaw, Manchester.—Booklet (No. 6) of 26 pages, containing specification, price and other particulars of Vaughan electric blocks, illustrated with half-tones and diagrams. The blocks are suitable for use at a fixed point, or suspended from a trolley on an overhead travelling crane, or on an overhead running track.

Book Notices.—We extend to our old-established contemporary, *L'Electricien* (M. Dunod, 47 and 49, Quai des Grands Augustins, Paris), a cordial welcome on its reappearance after nearly five years' suspension. Almost immediately on the declaration of war in 1914 the then editor took up important duties under the French Government in connection with the military telegraph system of Paris. The paper ceased operations for the period of the war. It has now recommenced publication, twice a month. It is one of our earliest French electrical contemporaries, and has reached its 35th year. We wish it complete and uninterrupted success under the new Rédacteur en Chef, M. Maurice Soubrier.

"Electrical Power Engineer." The official organ of the Electrical Power Engineers' Association. No. 1, Vol. I, July, 1919. Manchester: Electrical Power Engineers' Association. Price 2d.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXVIII. No. 7, July, 1919. New York: The Institute. Price $1.

"Elementary Lessons in Electricity for Bioscope Operators." By L. Calisch. Pp. x + 133 and 35 figs. London: Bioscope Publishing Co., Ltd. Price 3s. 6d. net.

"Technical Reporting." (Centenary Edition Revised.) By T. A. Reed. London: Sir Isaac Pitman & Son. Price 3s. 6d.

"Motor Transport Year-Book and Directory." Vol. IV for 1919. London: Electrical Press, Ltd. Price 12s. 6d. net.

Tees-side Engineers and the 44-Hour Week.—After being on strike eight weeks on the question of a 44-hour working week, the engineers and allied tradesmen employed at iron and steel works on the Tees-side have decided to resume work under normal conditions, a ballot taken on Saturday resulting in a large majority being in favour of the acceptance of the employers' offer of a joint conference. Failing a settlement by this conference the points in dispute will be referred to arbitration. Six weeks ago the men rejected the offer which they have now accepted.—*Daily Telegraph.*

Patent Application.—Messrs. B. G. Battson, J. F. Woosnam, and H. G. White, executors of R. F. Venner, have applied for restoration of Patent No. 23,082, of 1912, granted to R. F. Venner for "Improvements in electric cooking and heating apparatus."

Imperial Preference.—The *London Gazette* for August 8th contains the following Regulations issued by the Board of Trade under the Finance Act, 1919, "as to the proportion of value resulting from Labour within the British Empire":—

1. Save as hereinafter provided, goods shall not be deemed, for the purposes of Section 8 of the Finance Act, 1919, to have been manufactured in the British Empire unless at least 25 per cent. of their total value is the result of labour within the British Empire.

2. In the case of those classes of those goods in respect of which an Order has been made by the Board of Trade under Section 8, Sub-Section (2) of the Finance Act, 1919, no part of the goods shall be deemed to have been manufactured in the British Empire unless at least 5 per cent. of the total value of the goods is the result of labour within the British Empire.

3. Where a number of separate articles are included in one parcel or shipment, each and every article shall be considered separately for the purpose of calculating the proportion of value due to labour within the Empire.

4. For the purposes of these regulations the total value of an article shall be its cost to the manufacturer at the factory or works, and shall include the value of containers and other forms of interior packing ordinarily sold with the article when it is sold retail, but shall not include the manufacturer's or exporter's profit or the cost of exterior packing, carriage to port, and other charges incidental to the export of the goods subsequent to their manufacture.

5. In calculating the proportion of value which is the result of labour within the British Empire, there may be included under the head of labour the cost to the manufacturer of any materials of purely Empire origin entering into the composition of the article (including the interior packing specified in the Regulation (4), the cost of manufacture including wages, proportion of fuel, supervision and other factory expenses, and the cost of the labour of packing for retail sale.

The following may not be included in the proportion of value which is the result of Empire labour—namely, any materials or interior packings not entirely of Empire origin, manufacturer's profit or the profit or remuneration of any trader, agent, broker, or other person dealing in the article in its finished condition, the expenses of placing the goods in outside packages for export and the cost of such packages, transportation charges, insurance, and any other charges for services after the goods leave the place of production or manufacture.

6. Any question arising on the interpretation of these regulations shall be referred to the Board of Trade, whose decision shall be final.

Government Guarantee for British Exporters.—The *Times* Parliamentary Correspondent says that the Government have come to an important decision affecting our trading relations with the new States which have been set up on the Continent of Europe and with parts of Russia. They have decided to set aside £25,000,000 as a guarantee to British exporters against loss in their trading operations with these lands, which at the moment have neither a satisfactory currency nor enough goods to exchange for British exports to them.

For Sale.—Stoke-on-Trent Corporation invites offers for surplus arc lamps, carbons, sundry fittings, and scrap material. See our advertisement pages to-day.

Anglo-Italian Trade.—In reply to Lieut.-Colonel Aubrey Herbert, Mr. Bridgeman, Parliamentary Secretary to the Board of Trade, states that among steps taken to encourage trade with Italy are the negotiation of an arrangement for the mutual relaxation of import restrictions in favour of one another's goods, the relaxation of a D.O.R. Regulation in order to permit of longer credits, the provision of raw materials and transport facilities, the appointment of a Commercial Counsellor and Commercial Secretary at Rome, and the strengthening of our Consular representation.—*Times.*

Dissolutions and Liquidations.—Richard Wade, Sons and Co., Ltd., Hull.—The voluntary liquidation announced in our issue of August 8th is purely a formal matter, due to the amalgamation of the firm with others under the style of Gabriel, Wade and English, Ltd., with a capital of about a million.

Leon de Ridder & Co., electric light and power contractors and electrical and mechanical engineers, West Park Works, North Road, Kew Gardens, S.W., and 104 to 106, Leadenhall Street, E.C.—Messrs. L. L. F. and L. F. A. M. de Ridder have dissolved partnership. Mr. L. F. de Ridder has taken into partnership Mr. L. Mertens, and will continue the business under the same style at West Park Works.

Engineering Proprietary, Ltd., 97, New Bond Street, W.—Liquidator, Mr. A. H. Partridge, 3, Warwick Court, Gray's Inn Road, W.C.

Bankruptcy Proceedings.—W. J. McCombe, tramway manager, Kingston-upon-Hull.—Last day for proofs, August 30th. Trustee, Mr. W. G. Hall, Union and Smith's Bank Chambers, Hull.

Non-Ferrous Metal Industry Act.—The *London Gazette* for August 12th contains a list of further additions to licences granted under this Act.

LIGHTING AND POWER NOTES.

Bolton.—Street Lighting.—The Astley Bridge District Committee has accepted the tender of the Bolton Corporation Electrical Fittings Department for electrically lighting Blackburn Road and Belmont Road.

Bootle.—Price Increase.—The charges for electricity have been increased by another 20 per cent., a total war advance of 85 per cent. On the coal-clause contracts the increase will be 10 per cent., a total rise of 35 per cent.

Bridlington.—Mains Extensions.—Subject to a satisfactory agreement, the T.C. has decided to extend the cables at an estimated cost of £300.

Canterbury.—Price Revision.—The T.C. has adopted the following scale of charges for electricity from the September quarter:—Lighting, flat rate, 7½d. per unit; maximum demand rate, 8d. and 5d.; outside lamps, 6½d.; motor-generators, 3d.; power and heating, 3d. To power consumers there is a rebate of ½d. per unit if over 500 units per quarter are consumed, and of 1d. per unit if over 5,000.

Chatham.—Price Increase.—The Kent E.P. Co. has increased the price of electricity for power to 3½d. per unit net, as from August 1st.

Chester.—Price Increase.—The T.C. has advanced the price of electricity from September 29th for all purposes by another 10 per cent.

Continental.—Spain.—An application has been made to the Spanish Government for a concession to put down plant to utilise the water power of the river Tort, near Ritart (Province of Cerona), to generate electricity.

France.—The Paris Conceil Municipal has approved new works to be carried out in 1919-20, estimated to cost £3,000,000, for the distribution of electricity.

Deal.—Time Extension.—The B. of T. has extended for six months the Deal and Walmer Gas and Electricity Act, 1914.

Dewsbury.—Price Increase.—The T.C. has advanced the price of electricity to lighting consumers from 35 per cent. above pre-war rates to 40 per cent.; rateable value system, from 40 to 50 per cent. above pre-war; power and heating, from 60 to 70 per cent.

Restricted Supply.—The T.C. has approved a joint recommendation of the Dewsbury, Batley, Spenborough, and Heckmondwike Electricity Committees that the tramway companies serving the neighbourhood, power consumers, and entertainment proprietors be notified that from August 18th until the coal situation is relieved electricity supply will be provided only between 6 a.m. and 9.30 p.m. on week days, and there will be no Sunday supply. The tramway companies were consulted in the matter by the Joint Committees.

Doncaster.—Wages.—The National Amalgamated Union of Labour has accepted the following advances in wages to Corporation employés:—Men and women, 18 years of age and over, 3s. per week; adults, over 65 years of age, and youths and girls under 18, 2s. per week; a reduction of working hours to 48 per week without reduction of present wages. At the same time the Union asked for a reduction of hours to 47.

Douglas (Isle of Man).—The Legislative Council has decided between the rival applications submitted by the Douglas E.L. Co. and the Douglas Corporation for powers to light Douglas by electricity. The Council approved the company's scheme and rejected that of the Corporation. The main grounds for refusal were based upon the present condition of the borough finances.

Dublin.—Proposed Liffey Tunnel.—Borings are being made by the Corporation Electricity Department, with the permission of the Port and Docks Board, at Alexandra Basin, by the side of the Liffey. The intention is to carry the mains from the south side under the river to the North Wall and thence to the city, thus effecting a great saving in cables and upkeep. The sole object with which the present borings are being undertaken is the construction of a tunnel for the electric mains, but if they prove satisfactory, and if a tunnel for pedestrian traffic can be made at a reasonable cost, the Corporation will endeavour to get the Port Authority to join in the latter work.

Dutch Colonies.—Hydroelectric Schemes.—Large schemes for the development of electric power, with high-tension transmission, are in progress, or being worked out, one of which will develop as much as 30,000 h.p. There is undoubtedly a large future for all classes of electrical machinery. German competition has entirely ceased for the time being, and the natural suppliers will be Great Britain, America and Holland. No effort should be spared by British manufacturers to capture their share of this important trade.

Ealing.—Street Lighting.—The Uxbridge Road is to be lighted with half-watt lamps of 200-watt standard. The lamp standards are to be placed at the sides of the roads, about 400 yards apart. Hitherto the road has been lighted with arc lamps placed on the centre standards, and the new arrangement became necessary owing to the removal of these posts. The new system will mean a saving of about £500 per annum.

Ellesmere Port.—Prov. Order.—The U.D.C. has applied to the B. of T. for a renewal of the prov. order for E.L. which expires to-day. The B. of T. has informed the Council that it has granted an order authorising the Mersey Power Co. to supply the Ship Canal Portland Cement Works, which is in the urban area, and outside the company's area of supply.

Exeter.—Price Increase.—The price of electricity has been increased by 25 per cent., making a total war advance of 75 per cent.

Glasgow.—Year's Working.—The annual report on the working of the electricity undertaking for the year ending May 31st last, shows a revenue of £865,039, an increase of £76,037; working charges, £567,259, an increase of £24,542; depreciation, £60,464; interest, £106,482; sinking fund, £98,073; a surplus of £32,762 was transferred to the reserve fund, which now stands at £64,008. The net profit was an increase of £25,616 over last year.

Glossop.—Price Increase.—The Urban E.S. Co. has increased the price of electricity for power, from August 1st, the tariff now being:—First 100 units per quarter, 4d., plus 65 per cent.; heat, 3,000, 1½d., plus 65 per cent.; beyond, 1d., plus 65 per cent.

Halifax.—Price Increase.—The price of electricity has been increased from 5½d. to 7d. per cent. for lighting, against 4d. prior to the war, and for power by 30 per cent., the previous war increase being 72½ per cent.

High Wycombe.—Price Increase.—The E.L. and P. Co. has increased the price of electricity for power and heating by another 25 per cent., as from August 1st.

Honley.—Mains Extensions.—The B. of G. having applied for the extension of the electric mains to the Deanhouse Institution, the initial expense of which would be £460, the U.D.C. is to inform the Board that the Council will carry out such extensions if the Guardians will bear the initial expense.

Restricted Supply.—Owing to the coal shortage, electricity and gas was cut off from all classes of consumers from 1 p.m. to 7 p.m., and from 10 p.m. to 6 a.m., as from Monday last, the chairman being given power to vary the curtailment in the event of further coal becoming available.

India.—Burma.—The new hydro-electric plant installed at the Kaubauk Mine is the first of its kind to be erected in the district. Kaubauk is about 60 miles from Tavoy Town, and the scheme is important because it provides the mining company with power for the successful and profitable exploitation of the alluvial deposits that exist in the Tavoy district. It also furnishes to the wolfram industry in particular, and to the province in general, an incentive to utilise the natural resources so abundantly granted to Burma. About 3 miles to the southward of Kaubauk, and at the top of hills 3,000 ft. high, is a natural horseshoe-shaped valley across the heel of which a dam has been built, which impounds a reservoir which stores 500 million gallons of water. About 3 miles of pipe line convey the water to the power house, built on the edge of the mine at Kaubauk, the last portion of the pipe dropping nearly perpendicularly some 1,800 ft., and the head at the power house is 2,094 ft. The available energy is 1,000 b.h.p., only half of which is being utilised by the generator so far installed. The energy generated operates the machinery on a pump dredge, which uses 400 h.p., and also drives a ten-stamp battery which crushes the ore from the reefs in the hills.

Bombay.—The report of the directors of the Bombay E.S. and Tramways Co. for the year ending December 31st last, shows that the total revenue for the year amounted to Rs. 76,91,347, and the total expenditure to Rs. 32,67,097. The company's new 6,000 kw. turbo-generator is now in service, and promises to give excellent results.

The directors of the Framji Petit Mills propose to electrically drive their mill, and are negotiating with the Tata Hydro-Electric Supply Co.

Gwalior.—The Parbati Scheme, which is now under course of construction, provides for the damming of the Parbati River at Kaketo to a height of 150 ft. and the release of the encatchment water by means of a canal that runs along a range of natural hills for a distance of 40 miles to the outskirts of the city of Gwalior, where it drops down 300 ft. into turbines generating sufficient power to supply the needs of the town for lighting and fans and existing factory purposes.

Ahmedabad.—The report of the Ahmedabad Electricity Co. for the year ended September 30th, 1918, shows that it was compelled to notify the public of its inability to accept any new applications for supply after September 7th, 1918, as, after making provision for all contracts then existing, the capacity of the plant was not sufficient to meet further demands upon it. Until conditions permit of the purchase of additional plant on a more extended scale, the directors fear the natural expansion of the company's business must of necessity be curtailed. The total number of applications for supply received was 833. The units sold during the period under review were 5,16,877, as under:—55,429 for public lamps, 165,443 for lighting and fans, and 2,98,005 for power. The increase in the number of units sold for power purposes is largely due to the mill loads. The year's working resulted in a net profit of Rs. 58,168. The directors have arranged with Messrs. Callender's Cable and Construction Co., Ltd., for the maintenance of the distribution system for a further period of 12 months from December 1st, 1918.

Kilmarnock.—Price Increase.—The T.C. has increased the price of electricity for lighting by 12½ per cent., from August 15th. Meter rents are unaltered, and the coal clause automatically raises the price for power.

Lye.—Street Lighting.—The U.D.C. has decided to electrically light the streets.

Lincoln.—Price Increase.—The T.C. is to increase the price of electricity from the end of the present quarter by 20 per cent., making a total advance on pre-war rates of 70 per cent.

Llandyssul (Cardiganshire).—E.L. Scheme.—Work has been commenced in connection with the E.L. scheme being promoted by Mr. J. Isaac Thomas.

London.—Bermondsey.—Charges for electricity are to be increased by 10 per cent.

The Charing Cross, West End, and City E.S. Co. is applying to the B. of T. for power to increase the maximum charge from 6d. to 8d. per unit.

Malvern.—Price Increase.—The U.D.C. is to increase the price of electricity by 1d. per unit from the meter readings at Michaelmas, subject to the B. of T. granting an order for the maximum prices to be increased by 2d. per unit.

Manchester.—Textile Trade and Electrification.—A trade correspondent learns from reliable sources that both the Fine Cotton Spinners' Association and the Calico Bleachers' Association, Manchester, intend adopting electricity on an extensive scale in connection with the big programme of extensions they contemplate carrying out in the near future in the Manchester and Bolton areas.

Mansfield.—Loan Sanction.—The T.C. has received sanction to a loan of £20,500 for new generating plant. A prov. order is being applied for to enable the Council to supply electricity in bulk, or otherwise, to Kirkby, Sutton-in-Ashfield, and Huthwaite. A similar order is being sought by the Derbyshire and Notts. E.P. Co.

Pudsey.—Restricted Supply.—Owing to the coal shortage, electricity supply has been cut off between midnight and 6 a.m., beginning on Friday night last.

Ramsgate.—Price Increase.—The E.S. Co. has increased the price of energy for power by a further 30 per cent., a total war advance of 50 per cent.

Richborough.—Crane Drivers' High Wages.—The men employed as crane drivers by the South-Eastern Railway Co. at the new cross-Channel ferry port, in Kent, although their weekly wages now average, it is stated, £8 12s., have forwarded to headquarters in London a request for weekly wages of £9 15s. (£507 per annum), and have threatened to strike if their demands are not met.

Shelley.—Prov. Order.—The U.D.C. is to support the application of the Electrical Distribution of Yorkshire, Ltd., for a prov. order for the supply of electricity.

Shrewsbury.—Year's Working.—The total income of the electricity undertaking for the past year amounted to £12,444, an increase of £1,102. There was a gross profit of £3,346, but after providing for loan payments and sinking fund charges, there was a deficit of £93.

Sleaford (Lincs.).—Price Increase.—Owing to the 6s. increase in the price of coal, the charges for electricity are to be increased.

St. Helens.—Loan Sanction.—Ministry of Health sanction to borrow £1,700 for the laying of cable in the Pocket nook area has been obtained. With regard to certain other extensions, the B. of T. suggests that the increased load might be met by obtaining a supply of electrical energy from other sources, and a deputation has been appointed to interview Sir John Snell on the matter. The Electricity Committee has decided to apply to the Ministry of Health for sanction to a further loan of £2,223, being the amount overspent on a sanction dated September, 1915, for £15,000, for the purposes of electricity extension in connection with the purchase of plant. The electrical engineer also reports a net amount overspent of £1,057 in connection with the laying and construction of mains and services, and that a further amount of £4,943 is required for prospective mains and services. Application is to be made to the Ministry of Health for sanction to borrow these two sums, whilst a further amount of £598 overspent on a loan for £1,100 sanctioned in January, 1918, is to be debited to the reserve fund.

Price Increase.—In view of the increased cost of coal, the charges for electricity, both for power and lighting, are to be increased as from August 1st to 80 per cent., instead of 70 per cent. as hitherto.

Stratford-on-Avon.—Proposed Price Increase.—The Electricity Co. has applied to the B. of T. for power to increase the statutory charges for electricity for lighting by 2d. per unit.

Stroud (Glos.).—New Generating Station.—The E.S. Co. has applied to the B. of T. for sanction to construct a generating station at Bowbridge, in the area of the R.D.C.

Swansea.—Time Extension.—The B. of T. has extended until August 7th, 1920, the Swansea Corporation Act, 1912.

Tasmania.—Year's Working.—The Launceston city electrical engineer (Mr. R. J. Strike), in his report for the year ended June 30th last, states that the revenue from light and power was £25,447, an increase of £1,490 over last year, made up as follows:—Private lighting, £11,181, increase £655; street lighting, £3,117, increase £52; power, £7,596, increase £684; heating, &c., £1,552, increase £88; rentals, motors, heaters, meters, &c., £2,001, increase £10. The working expenses totalled £11,485, an increase of £206. The balance of £13,962, being the highest amount so far carried forward to this account. Interest and sinking fund payments absorbed £9,876, leaving a net profit on the year's working of £4,086. Out of this profit £4,000 has been transferred to the general account of the city, making a total of £15,272 so far handed over to to this account. The expenditure on the undertaking totals £203,950, and by transfers from the reserve fund the capital account now stands at £172,974. The accumulated funds are:—Sinking fund, £43,150, equal to 25·3 per cent. of capital; reserve fund, £9,244, equal to 5·3 per cent. of capital. The gross profits of the undertaking since its initiation in 1895 now total £194,159, out of which it has paid interest on the money borrowed, and transferred moneys, as follows:—Transferred to sinking fund, £29,861; reserve fund, £36,602; general account, £15,272; total, £81,735. The connections to the mains total 6,035 KW. (8,090 E.H.P.) made up as follows:—Lighting, 1,861 KW.; power, 3,087 KW.; heating, 1,087 KW. The increase over last year was 312 KW., made up as follows:—182 lighting connections representing 3,108 30-watt lamps; 40 motors, representing 161 B.H.P.; 90 heaters, irons, &c., representing 75 KW. The maximum load on the combined stations was 1,408 KW., equivalent to 1,887 E.H.P., being an overload of 171 KW. on the normal rating of the machines running at the time. The number of units generated totalled 4,079,130, an increase of 227,250 over last year.

Todmorden.—Bulk Supply.—The Yorkshire E.P. Co. has completed negotiations for a bulk supply of electricity to the borough.

Tunbridge Wells.—Price Increase.—The T.C. is to increase the price of electricity, as from September 29th, by 2d. per unit for lighting; by 1½d. for heating and power; and by 10 per cent. for public lighting; and to apply to the B. of T. for an order to increase the charge to consumers at Speldhurst from 7d. to 9d. per unit.

United States.—According to the *Engineer*, the total number of electricity generating establishments in the United States in 1917 was 6,541, 4,224 being private and 2,317 muncipal undertakings. The total primary power in 1917 amounted to nearly 13,000,000 H.P., an increase of 70·8 per cent. as compared with 1912. Of this power about two-thirds was derived from steam and about one-third from water, the slight surplus being obtained from internal combustion engines. The total dynamo capacity in 1917 was, roughly, 9,000,000 KW., 74·3 per cent. more than in 1912; while the output of energy aggregated 25,500,000 KW.-hours, an increase of 119·9 per cent. for the period 1907-12.

Watford.—Price Increase.—The price of electricity has been increased for lighting to 8d. per unit, and for other purposes by 10 per cent., as from the quarter commencing October. The charge for power for pumping at the sewage works is to be increased by 20 per cent. Application has been made to increase the minimum price from 8d. to 9d. per unit.

West Ham.—Year's Working.—The accounts for the year ending March 31st last show that 45,750,681 against 42,856,405 units were generated, and the quantity sold was:—Private lighting 2,325,340, against 2,515,834; power 29,757,225, against 27,250,787; heating and cooking 366,474, against 412,429; public lighting 172,556, against 59,261; tramways 5,594,658, against 5,598,589. The maximum supply demanded was 11,450, against 12,075 KW. Working expenses increased by £44,032 to £204,514; in addition, war allowances amounted to £4,082. The income increased by £49,037 to £230,741; gross profit increased by £5,004 to £26,227, or, after including war allowances, an increase of £5,637. Repayment of mortgage loans, contributions to sinking funds, and interest amounted to £46,931, and special expenditure to £564, which leaves a deficit of £24,975.

TRAMWAY AND RAILWAY NOTES.

Brighton.—Track Reconstruction.—On the improvement of the tramway track £10,000 is to be spent per annum for the next seven years, in addition to the whole of the present reserve and renewals fund, which now stands at £22,533.

Bristol.—The B. of T. has extended, until June 24th, 1920, the Bristol Tramways Act, 1915.

Burnley.—Year's Working.—The annual report on the working of the tramway undertaking for the year ending March 31st last, shows that the number of passengers carried increased by 2,315,587 to 20,111,603; gross income by £26 732 to £124,212. Electricity used increased by 162,684 to 3,691,557 units. Working expenses amounted to £95,209, against £68,203; interest was £6,247, against £6,590; sinking fund £9,171, against £8,941, now stands at £107,990. The net balance was disposed of as under:—Rent on tramways owned by outside authorities, £1,456; income-tax, £5,379; reserve fund, £6,020, which latter now stands at £41,214.

Bury (Lancashire).—Holidays.—The T.C. has decided to grant six days' holiday, with pay, yearly to the skilled men employed at the tramway depôt, the days to include Christmas Day, New Year's Day, and Good Friday.

Dublin.—Forty-Eight Hours' Week.—The Dublin United (Electric) Tramways Co. has inaugurated a 48-hours' week for its employés, which means a reduction of 12 working hours in the week. Sunday work will be paid for at overtime rates, and a rest day is to be given every seventh day, though, should work be necessary on this day, payment will be made at the rate of time-and-an-eighth. The parcels employés do not come under the new arrangement, but they are seeking concessions.

Lancaster.—Electric 'Buses.—The T.C. has appointed a Committee to consider the substitution of electric 'buses for tramcars.

Liverpool.—Strike.—The tramway strike was settled on Friday, last week, the men resuming work on pre-strike conditions. Wages and working hours are to be considered at the next meeting of the Tramways Committee.

London.—Strike.—With the return of the strikers, the full services on the London and South-Western Railway and the City and South London tube were running on Friday last.

L.C.C. Pays Damages.—The L.C.C. was ordered to pay £30 damages and costs at Lambeth County Court last week to Mrs. A. Garland for injuries received in falling off a tramcar. She was boarding the car when the conductor shouted from inside, "Full up; get off." The car started, and she was thrown into the road and badly injured. The chain was not fastened at the entrance.

Owing to an electrical defect to a train at Mark Lane on the District Railway on Saturday morning, west-bound trains were delayed for about 20 minutes at a busy period.

Heat causing the rails on a section of the District Railway to bulge upwards, the service was temporarily restricted to a single line between North Ealing and Sudbury.

Maidstone.—The T.C. has deferred for a year the scheme of tramways through the North Ward to Chatham. The pre-war cost was £129,800, and the present-day outlay is estimated at £233,000.

Salford.—Women Employes.—The dispute which arose with reference to the continued employment of women, who were engaged in 1915 to replace men called up for service, at the cash receiving officers of the tramways department, was settled on August 7th. A deputation from the employés waited on the Tramways Committee, and after an interchange of views, the Committee passed a resolution that with a view to finding employment for discharged or demobilised soldiers, the present staff of female receiving clerks be replaced by male clerks, such decision not to prejudice any action of the Committee in the future.

St. Helens.—Purchase.—The Corporation is on the point of taking over the local tramways from the New St. Helens and District Tramways Co., the lease expiring in a a few weeks' time. The Corporation has already appointed its own manager, and has resolved that he obtain tenders for the supply of four new tramcars, also that he should approach the South Lancashire Tramways Co. and report as to a possible arrangement by which the St. Helens Corporation cars shall run on the length of line between Haydock and Ashton-in-Makerfield, the running powers of the Corporation already extending as far as Haydock in that direction. In the other direction, towards Liverpool, the Corporation running powers extend as far as Prescot, where they will join up with the Liverpool Corporation cars, which will take over the company's powers from Knotty Ash to Prescot. The Tramways Committee has had a report with regard to the plant and furniture now in possession of the Tramways Co., which has asked the Committee to nominate a valuer, and Mr. John Pritchard, of the Brooksfield Foundry, St. Helens, is to act on behalf of the Corporation. The Committee has decided to take over the employés, as far as possible in their present capacities, subject to satisfactory services, and has also resolved to obtain quotations for insurance against third-party claims, including claims in respect of the track and overhead equipment, and to become members of the Municipal Tramways Association and the Tramways and Light Railways Association.

Swansea.—Time Extension.—The B. of T. has extended for 12 months the Swansea Corporation Act, 1912, for the completion of the tramways.

Tasmania.—Year's Working.—The annual report on the working of the Launceston tramways undertaking shows that the track mileage remains the same as at the end of June, 1917. The total revenue from all sources was £25,064, an increase of £1,295 over the previous year. Of the total revenue the traffic receipts were £24,988, an increase of £1,963. The total expenses, including interest, &c., was £26,347, an increase of £3,840 over the year 1917. The principal items of increase were:—Wages of motormen, conductors, &c., £2,112; permanent way, repairs, &c., £627; cars, maintenance and repairs, £726. The total increase in wages paid on both the revenue and maintenance accounts amounting to £2,890, equivalent to 26·115 per cent. Heavy cost of materials has also been another factor. To the net revenue account was carried £8,941. Interest and sinking fund absorbed £5,034, and maintenance £5,190, making the loss on the year's working £1,283. The accumulated amount now standing to the credit of the sinking, reserve, and maintenance funds is £12,114. The passengers carried totalled 3,011,764, an increase of 278,225 over 1917, while the average journeys per head of population served have risen to 201. The population per street-mile being 1,688 only these results cannot be regarded as other than satisfactory, especially when it is considered that the car-milage run has only been increased by 3,282 car-miles, less than 1 per cent.

Willesden.—Electric Vehicle.—It is proposed to purchase an electric lorry at a cost of £1,100, for use in connection with the extension of mains.

United States.—Strike.—The strike on the surface and elevated street railways at Brooklyn resulted in a complete cessation of the services on Wednesday, last week. Disorders occurred when strikers attempted to remove strikebreakers from cars, whereupon police rode in them. Several cars were wrecked. The men demand recognition of their Union, an eight-hours' day, and an increase of 25 per cent. in wages, all of which the Brooklyn Rapid Transit Co. has, so far, refused to consider. During the morning rush hours the company was able to run a good service, but during the day the attitude of the strikers grew more menacing. Finally, after the protection afforded by stationing two policemen in every tramcar and several in each underground train had proved inadequate, the service was entirely suspended. Strikers attacked loyal drivers and policemen and wrecked cars in the streets. A sympathetic strike of tramwaymen in Manhatten is threatened.

West Ham.—Year's Working.—The accounts for the year ending March 31st last, show that the expenditure increased by £30,750 to £199,576; in addition, war allowances amounted to £15,443. The income, after deducting £3,853 due to other authorities in connection with through-running, was £237,487, an increase of £48,636. The result, including war allowances, was a surplus of £22,469; excluding war allowances, there would be a gross profit of £37,911. Repayment of mortgage loans, contributions to sinking funds, and interest amounted to £31,056, a decrease of £579, which leaves a deficit of £7,703. Excluding the £15,443 war allowance, there would have been a surplus of £7,739.

York.—Loan.—Application is to be made to the B. of T. to extend the limit of the amount authorised to be borrowed under the York Light Railway Orders from £186,150 to £203,550; £17,400 being in respect of purchase of new cars; triangles and circles at termini and overhead work, £2,150; curves at Lendel Bridge and overhead work, £3,997; and for amounts overspent, £1,253.

TELEGRAPH AND TELEPHONE NOTES.

Alsace-Lorraine.—The telegraph service was maintained during the Armistice by retaining the existing organisation in its entirety. Satisfactory working was attained three weeks after the French occupation, notwithstanding the fact that the Germans had removed all the circuits that were unimportant to them, and most of the switchboards and subscribers' instruments, and the circuits within the zone of fire were practically destroyed. The return of the German personnel commenced in February, and was completed by April 5th, when the chiefs departed.—*Tech. Supp. to the Review of the Foreign Press.*

Formosa.—According to the *Review of the River Plate*, the telephone at Mojon del Fierro has been out of working order for the past month. The care of the lines is entrusted to a schoolboy, and when the communication is interrupted, the clients themselves have to carry out the repairs.

France.—Censorship of telegrams in France will, according to the *Temps*, be raised as from midnight to-night.

New Marconi Patents.—Mr. G. C. Isaacs, presiding last week at the general meeting of the Marconi Co., stated that very important discoveries had been made recently in respect of wireless telegraphy and telephony, and patents had either been taken out or applied for. The company had not been able to arrive at any settlement with the P.M.G. in respect of services rendered during the war. They hoped to arrive at settlements with the Admiralty, War Office, and Air Ministry, in regard to the extensive use made by each of them of Marconi patents.

Magnetic Storm.—A heavy magnetic storm which began on Monday continued throughout the United Kingdom on Tuesday, affecting telegraph and telephone services and causing delays all over the country. Similar trouble is reported from Sweden, and in Spain telegraphic and telephonic communication was cut off all Monday morning. According to the daily Press the P.O. Engineer-in-Chief says the storm is the worst experienced for 10 or 12 years; it affected all wires and the Irish cables were difficult to work.

Telephone Tariffs.—The Postmaster-General states that the present system of charging by telephone areas will be materially altered in connection with the proposed revision of telephone tariffs.

Writing to the *Times* a correspondent, who lives 4½ miles from the telephone exchange at Alresford, Hampshire, says that, thinking he could make good use of a disused telephone line passing close to his house, he wrote to the P.O. inquiring what the charge would be for installation and use of the line. The reply stated that the line belonged to another department, and that if it were available the annual rent would be £41 5s., covering 300 calls to the Alresford exchange, with a surcharge of £4 in the first year. This rent is calculated at the rate of £1 5s. per furlong beyond the first mile from the exchange, and works out 2s. 9d. per call for a distance of 4½ miles.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia.—Sydney.—September 10th. N.S.W. Railways and Tramways Department. D.C. motors. Chief Electrical Engineer, 61, Hunter Street, Sydney.

November 10th. City Council. Supply of electric motors. Particulars from Electric Lighting Department, Town Hall, Sydney.

Eccles.—August 25th. Electricity Department. Three 500-K.V.A., 3-phase, A.C. transformers. (August 8th.)

Edinburgh.—September 11th. T.C. Three 10,000-KW. turbo-alternators; six water-tube boilers, capacity 65,000 lb. per hour. (August 8th.)

Lincoln.—September 2nd. Corporation. One 25-ton overhead electric crane. (August 8th.)

London.—L.C.C.—September 2nd. Four electric tower wagons for the Council's tramways. (See this issue.)

Motherwell.—T.C. Tenders, including electric lighting, for trades in connection with housing scheme. Mr. W. Ross, Burgh Surveyor.

Nottingham.—August 21st. Electricity Committee. Supply and laying E.H.T. underground mains, supply and drawing-in one tramway feeder cable, two 500-KW. rotary converters, transformers and switchgear. (See this issue.)

Stockton-on-Tees.—August 30th. District Fund, Gas and Electricity Committees. Six months' supply of articles and stores. (See this issue.)

Stoke-on-Trent.—Electricity Department. Cooling towers. (See this issue.)

Portsmouth.—September 2nd. Tramways Committee. 12 months' supply of stores, &c., including various electrical items. (See this issue.)

CLOSED.

Accrington.—Electricity Committee:—

5,000 yd. of cable, £4,001.—W. T. Glover & Co., Ltd.

The Committee has decided, subject to the consent of the Minister of Health to the borrowing, to accept the tender of the B.T.H. Co. for turbo-generator and condensing plant, at £32,666; turbine and alternator, £24,000; condenser, £7,800: air filter, £586. Eleven firms tendered.

Blackburn.—The T.C. has accepted the tender of the English Electric Co., Ltd., for the erection of the new generating station at Whitebirk; only two firms tendered. The total cost of the station is estimated at £270,000.

Bolton.—Electricity Committee. Switchgear for Spa Road Works. Bertram Thomas (Manchester).

Dundee.—Corporation Electricity Committee:—

Ferro-concrete piling in connection with the extension of the electrica station at Stannergate, £4,964.—Yorkshire Henebique Co.

St. Helens.—T.C.:—

Cable.—B.I. & Helsby Cables, Ltd.

Sunderland.—Corporation. E.H.T. switchgear. Ferguson, Pailin & Co.

Torquay.—T.C.:—

Apparatus to increase the burning capacity of boilers with oil fuel.—Babcock & Wilcox, Ltd., £163.

Storage batteries at destructor.—Tudor Accumulator Co., Ltd., £230.

Winchester.—T.C.:—

Coal for the electricity works.—Messrs. R. G. Gifford and Bradbury, Son and Co., Ltd.

NOTES.

The Delon Rectifier in Agriculture.—Referring to the article under the above heading in our last issue, we are informed by Mr. C. T. Allen, assistant manager, South Wales E.P. Distribution Co., that in the experiments described, only one-half the complete wave of the alternating E.M.F. was utilised, as suitable condensers for rectifying the complete wave were not available at the time, therefore the maximum instantaneous voltage of the supply was 45,000, whilst the pressure actually maintained was from 30,000 to 39,000 volts D.C.

Electrical Development Association.—We have received two pamphlets from the E.D.A. which will be found of interest to those concerned. One (E.D.A. 7, July 17th) on housing schemes and electricity supply, is directed to the management of electricity supply authorities, and the other; (E.D.A. 9) on housing construction and electricity supply, is for circulation amongst members of councils, local authorities, and those interested in the provision or control of housing colonies. We hope to refer more fully to these pamphlets at a later date.

Educational.—An interesting report on work done during the period of the war at the Birmingham Municipal Technical School states that facilities were afforded there for the Electrical Engineering Department of the University (whose buildings were used as a war hospital), and that two courses of full-time day classes were conducted in the Electrical Engineering Department, with the object of training wireless operators for the Merchant Service, and training disabled soldiers in electrical work. The development of the electrical classes has been phonomenally rapid, and additional accommodation is now provided on three floors of a factory in Ludgate Hill. At one time there were 205 day students undergoing training simultaneously, in addition to 1,040 military and naval recruits. Since then 200 disabled soldiers have been entered for the electrical course, under a scheme sanctioned by the Ministry of Pensions, which pays the trainers a maintenance allowance. One-third of this number are still in attendance, and another third has completed the course and are satisfactorily placed in works.

The Council of the City and Guilds of London Institute has awarded diplomas of "Associate" to the following students who completed a full course of instruction at the close of the recent session:—

In Engineering (*A.C.G.I.*).—J. de Aguiar, R. H. Barfield, J. A. A. Best, C. Grad, A. G. Griffith, T. J. Griffiths, F. St. A. Hartley, G. H. Hopewell, E. W. A. Jammoulle (Siemens Medal), A. A. de Lemos, K. P. P. Menon, R. B. McC. Potter, J. H. Reyner (Henrici Medal), C. J. H. Trutch, S. Vaughan, A. C. Warren (Henrici Medal), H. C. Wilkinson, E. W. Workman, R. G. P. Wyatt (Bramwell Medal).

In Applied Chemistry (*A.C.G.F.C.*).—E. Fisher, J. R. Fraser, F. D. M. Hocking, S. J. Hopkins, L. Mendel, N. Plotzker, N. Singer, C. E. Spearing, H. G. Tribley, H. B. Williams.

Municipal College of Technology, Manchester.—We have received the prospectus of the 1919-20 session, containing particulars of the University engineering courses. Prof. Miles Walker is the head of the Electrical Engineering Department.

Power Factor Improvement.—A *résumé* is given in the *Electrical World* of information presented at a meeting of the Boston Section of the Amer.I.E.E. concerning work done in New England in power factor improvement. In future New England power contracts will embody a power factor clause based on 80 per cent. minimum, penalties being imposed for lower power factor (probably 5 per cent. between 70 and 80 per cent. power factor, 15 per cent. between 60 and 70 power factor, 25 per cent. between 50 and 60 per cent. power factor, and 50 per cent. below 50 per cent. power factor). With the exception of the larger consumers, it is felt to be more economical to install large capacity condensers in the sub-station rather than smaller condensers in consumers' plant. The Boston Edison Co. is penalising power factor under 80 per cent. in the case of all consumers having 50 KW. or higher demand.

Scientific Lighting and Industrial Efficiency.—In a lecture on this subject at the British Scientific Products Exhibition, on July 28th, Mr. Leon Gaster pointed out the close relation existing between good industrial lighting and the health of workers, and gave many instances of accidents due to insufficient or badly-arranged conditions of illumination. Light, he said, was a "tool," and it was absurd to install expensive machinery and to pay highly-skilled workmen, and then to neglect the relatively small expenditure on illumination necessary to the efficient performance of work. Instances were quoted showing that, as a result of improved lighting conditions, increases in output of 8-27 per cent., had been recorded, and another factor of importance was the reduction in the amount of spoiled work. The cost of lighting formed only a small proportion, in some cases less than 1 per cent. of the wages bill. Good industrial lighting was, therefore, amply justified on economic as well as on humanitarian grounds. Mr. Gaster recalled that previous to the war inquiries into industrial lighting were being initiated by several of the chief European countries, and in the case of Great Britain, the Departmental (Home Office) Committee on Lighting in Factories and Workshops had been duly formed, and had issued a most valuable interim report in 1915. In this report it was suggested that there should be statutory provision to secure adequate lighting in factories, and it was hoped that a reference to the matter would be inserted in the Factory Act in the near future. During the war considerable progress had been made in the United States, where five States had already adopted legislative codes on industrial lighting. He hoped, therefore, that this country would shortly regain the lead which it formerly held. Judicious measures of this kind would be welcomed by worker and manufacturer alike, and ought ultimately to be the subject of international action, together with other matters affecting the health and efficiency of the workers of the world. At the present time, when the need to increase our production was so great, and when the necessity of saving fuel was so evident, the application of scientific methods to factory lighting was of special importance. During the last 10 years much useful information had been acquired by the Illuminating Engineering Society in this country, one very important step being the development of simple instruments for measuring illumination. The Illuminating Engineering Society was in a good position to render assistance in making clear the essentials of good industrial lighting, by means of lectures and demonstrations.

Electrified Seed.—On Saturday last, Messrs. Eastes and Loude, seed merchants, of Ashford, conducted a party, including Prof. Somerville, of Oxford, Dr. Finlayson, the fungologist, a representative of the B. of T., and other gentlemen, to view a field of wheat at the farm of Mr. Pledge, Bodsham Green, Elmstead, near Ashford, Kent. A portion of the seed sown in this field was electrified before sowing, the remainder was not. The crop growing from the unelectrified seed was very badly infected with the fungus of rust; but that growing from the electrified portion was entirely free. So marked was the difference that at the margin where the two crops adjoined, we understand it was possible to pick out single ears of each portion with certainty.

The plot selected was about 8 acres in extent of poor hill-top land. A scanty crop of oats was taken off part of the land last year, and owing to the failure of a plant of swede turnips, the remainder was fallowed. In October last the whole of the 8 acres were sown with Webb's standard red wheat, 3 bushels to the acre, all of which had received the usual copper dressing, but half of the seed was electrically treated in a bath of calcium oxide solution, and then lightly kiln dried. The corn was sown broadcast, and the untreated seed was up 10 days before the other, but the treated seed, when started, is described as making better progress, and showing greater promise. The untreated crop was very scanty and of an unhealthy colour, not likely to return the 3 bushels to the acre put in, while on the treated plot both corn and straw look healthy, and promise a fair yield. The crop, we understand, is to be reaped shortly.

Electrical Aids for the Deaf.—With reference to our description of electrical aids for the deaf, as exhibited at the British Scientific Products Exhibition, we are informed that the L. M. Ericsson Manufacturing Co., Ltd., also manufactures such aids under the name of "Auriphone."

Electric Trucks in New York City.—Of the total number of trucks in operation in New York City, 10 per cent. are said to be propelled electrically. In round figures, there are about 33,000 trucks in operation, those using storage batteries numbering 3,288. Before the next year the number of electrics will be considerably augmented.—*Electrical Review*, Chicago.

Joint Industrial Councils.—The Industrial Councils Division of the Ministry of Labour reports that Joint Industrial Councils have now been established affecting 2,438,500 workpeople. The building trade contributes the largest number—553,000.

Trade-Marks Bill.—The Bill has been considered on report, and read a third time.

Patents and Designs Bill.—The House of Commons, on Friday last week, considered the Bill as amended in Standing Committee. Mr. Wallace moved a new clause, rendering it unlawful to attach a condition to a contract prohibiting or restricting the purchaser from using articles or processes not supplied by the seller, or requiring him to purchase from the seller articles not protected by the patent. Sir E. Pollock, Solicitor-General, thought the clause went too far; it was necessary in certain cases to insert a condition that the patented article should be used with a certain kind of material. It was, however, the proposal that in cases where these conditions were considered harsh opportunity would be given to both sides to be heard by a tribunal. The clause was withdrawn. Sir E. Pollock moved an amendment, which provided that the right to use an invention for the service of the Crown should be deemed always to include the power to sell any articles made in pursuance of such right, which were no longer required for the service of the Crown. The amendment was agreed to, and the Bill was read a third time.

On Clause 1, which contains provision for the prevention of abuse of monopoly rights, there was some criticism. Sir E. Pollock, Solicitor-General, offered to meet the case put forward by an amendment to sub-section 8, which enacts that the monopoly rights under a patent shall be deemed to have been abused if any trade or industry in the United Kingdom or any person or class of persons engaged therein is unfairly prejudiced by the conditions attached by the patentee to the purchase, hire, or use of the patented article, or to the using or working of the patented process. He proposed after the word "hire" to insert the word "licence." This amendment was carried. Mr. Alfred Davies moved an amendment limiting the maximum royalty payable to a patentee to 2½ per cent. of the selling price of the articles to which the patents relate. Sir E. Pollock said that in a great many cases if such a limit existed it would be impossible to get capital introduced for working patents; the amendment was rejected, and the clause as amended was then agreed to.

On Clause 6 Sir Croydon Marks moved an amendment extending the term limiting the duration of patents from 14 to 18 years, instead of to 16 years, as provided in the Bill. Sir Ernest Pollock opposed. He said the Bill already gave a patentee the right to apply for an extension if damage could be shown, and such extension could be granted up to a limit of five years, making 21 years in all. The amendment was withdrawn. On Clause 8 the Solicitor-General gave an undertaking that an amendment would be brought up later providing that an independent tribunal would decide the amount to be paid to a patentee whose invention is used by a Government department. He also undertook to introduce an amendment to clause 15, so as to give a right of appeal with respect to the registration of designs binding the Crown. An amendment to the schedule by Mr. Grattan Doyle to reduce fees by half for renewing patents was opposed by the Solicitor-General, and withdrawn.

The Electricity (Supply) Bill.—On Tuesday, last week, Standing Committee "B" of the House of Commons resumed consideration of proposed amendments to Clause 7, which relates to the acquisition of generating stations. Mr. MacVeagh's amendment, providing that where a tramway undertaking was bought regard should be had to the terms on which it was already purchasable, was opposed by Mr. Shortt (Home Secretary) and defeated.

Mr. George Balfour moved an amendment to secure payment of an additional sum as compensation for the unexpired tenure of a generating station or main transmission line; without some such provision it was plain robbery. Mr. Shortt, who opposed, said the amendment was simply another attempt to get a fair bigger price than the public ought to pay. Lieut.-Comdr. N. Craig thought the shareholders were entitled to be bought out at a premium, and Mr. Neville Chamberlain said that where companies could not be bought out for a certain number of years, they should be compensated for that period during which they might earn more dividends. The amendment was rejected.

On Wednesday, last week, Major Barnes opposed Mr. G. Balfour's movement to enact that district boards should be bound to supply all electricity to meet the requirements of the authority, company, or person whose generating station they were acquiring at prices to be agreed or otherwise determined by the electricity committees, because it implied, he said, that in certain cases electricity would have to be supplied at a loss. Mr. Neal also opposed the amendment as being too wide. Mr. Shortt said the intention was that the district boards should supply at the price at which the undertakings had to supply. The clause had been expressly put in as a protection to the Corporations and persons whose stations had been taken over. If they did not want the protection he had no desire to press it. The Bill put upon the district boards the obligation that they shall supply the whole of the electricity required in their neighbourhoods. The amendment was thereupon withdrawn.

A further amendment, moved by Mr. Dawes, to provide for the payment of compensation by local authorities to companies or persons for loss they might suffer by interruption of supply resulting from acquisition, was agreed to by the Government.

Mr. Shortt's movement to add to Clause 7 the following: "Where a generating station which is vested in a district electricity board under this section is in course of construction, extension, or repair, the rights and liabilities of the former owners thereof under any contract for such construction, extension, or repair shall be transferred to the Electricity Board," was agreed to.

Lieut.-Comdr. N. Craig moved this further addition: "Interest at the rate of 6 per cent. per annum upon the standard price shall be paid by the district electricity board to the former owners of any such generating station or main transmission line as from the date of vesting thereof in such board until payment." Mr. Shortt said that he was prepared to accept this amendment, but could not promise to accept the 6 per cent. He was, however, prepared to add the words to the clause. The committee agreed to the proposed addition to the clause.

Mr. Shortt proposed a further addition to the same clause, as follows: "Where in any generating station vested in a district electricity board under this section there is contained any plant which, in the opinion of the Electricity Commissioners, forms an essential part of the distribution system of the former owners of the generating station, that plant shall, notwithstanding such vesting, remain the property of its former owners, who shall, so long as electricity is supplied for distribution from that station, at all times have the right of access thereto." This amendment was accepted, and Clause 7, as amended, stands part of the Bill.

Mr. Bridgeman, Parliamentary Secretary, Board of Trade, said that the President of the Board of Trade wished him to ask the committee to reconsider their decision in relation to the adjournment. It was hoped that the committee might continue to sit longer, in view of the fact that the House was not likely to rise for some time.

General dissent was expressed at the suggestion, and the committee adjourned until the autumn session.

We are informed by Mr. H. H. Morton, Electrical Trades Union, London, Station Engineers, No. 1 Branch, that the following resolutions have been forwarded by the Executive Council: "(1) That a protest be sent to the B. of T., the Trade Union Congress Parliamentary Committee, and the Labour Party against the action of the B. of T. in introducing the Electricity (Supply) Bill, without first consulting the Trade Union Congress Parliamentary Committee and our representatives, as was promised by Sir A. Stanley when President of the B. of T." "(2) That we ask the Parliamentary Labour Party to oppose clause 36." Mr. Morton points out that on June 11th, 1918, Sir A. Stanley, then President of the B. of T., received a deputation from the E.T.U., and briefly the president admitted that the claims had been established, namely, (1) that the power stations should be publicly owned; (2) that labour should be represented upon any scheme providing for the administration of such undertaking, and (3) that provision should be made for compensating *any* employés whose positions might be disturbed.

Where Our Coal is Used.—In reply to a Parliamentary question, Mr. Bridgeman (Secretary, Board of Trade) said that in the year 1917 the coal available for home consumption, after deducting the amount required for the operation of the coal mines, was estimated to have been distributed among the principal industries and other uses approximately as follows :—

	Million tons.
Mines (other than coal mines) and quarries ...	2½
Railways, for locomotive purposes	13
Gas works	18½
Electricity works	7
Blast furnaces	19½
Other uses in metal industries	30
Textiles	9
Food and drink	3
Chemical and allied trades	5
Paper, printing, and allied trades	2
Building, clay and stone	6½
Miscellaneous industries	3
Domestic, &c.	64
	183

Fatality.—On August 2nd, a workman at the Worcester Electricity Works was crushed in machinery, and met instant death. At the inquest the Coroner found that the man met his death by his foot accidentally catching between a rope and a drum whilst the winch was in action. No one was present at the time. Verdict, "Accidental death." The chairman of the Electricity Committee said they would take any steps necessary further to safeguard employés.

Appointments Vacant.—Lecturer in electrical engineering (£350, rising to £490), with additions for special qualifications or previous experience, for the Woolwich Polytechnic; telegraph inspectors and mechanicians (£250 + £120) for the Post and Telegraphs Department of the Nigeria Government; jointer (80s. 4d.) for the Blackburn Corporation Electricity Department; telegraph and telephone construction foreman (£300) for the Government of Ceylon. See our advertisement columns to-day.

Machinery or Immigration?—Writing editorially, under the title "Machinery Must Replace Immigrants," our Chicago contemporary, the *Electrical Review*, says :—"Now that peace is here, swarms of aliens are leaving this hospitable land and going back to their native abodes with their pockets swollen with American money earned during their profitable sojourn amongst us. The great majority of these emigrants have not assimilated our ideas or customs, or even our language. Their departure is, therefore, in one respect, no serious loss to our country. But it is a substantial loss to our labour supply. To what extent immigration will replace emigration is very uncertain. There is one certainty, however. It is that machinery will have to be called on more and more to do work that is now done manually, so that the remaining labour will be more effectively applied. Increased use of machinery means more electric motors for driving it and more electric power for keeping the motors running. The electrical industry is ready to do its part in this case just as it has done in relieving the emergency in household work since servants became scarce."

U.S. Railway Electrification.—In a paper by Mr. W. B. Potter and Mr. S. T. Dodd on the "Electrification of Main Line Railroads," read before the Western Railway Club in April, it was stated that the total mileage under electric operation in the United States was 265,218, as against 713,120 for the rest of the world. The former represented 400,000 miles of single track, and there were, in addition, 50,000 miles of street and urban electric railways. There were 675 electric locomotives, as compared with 450 for the rest of the world. The former operated on a total length of 8,300 miles of single track, and the latter on 1,750 miles.—*Engineer.*

Industrial Medicine.—There is a movement on foot to urge the General Medical Council to authorise the granting of a Diploma in Industrial Medicine. Employers have followed the experiments conducted by the Ministry of Munitions on questions of fatigue, overtime, early hours, and so on, with close attention. They have evinced a desire to obtain further information, but there are not yet many medical men who have studied the subject closely.

Messrs. Macmillan have just published the first number of a new journal, *The Journal of Industrial Hygiene*, under the joint editorship of Dr. David L. Edsall, U.S.A., and Dr. Stanley Kent, Great Britain, whose work on "Industrial Fatigue" is so well known. The journal has grown out of the recent establishment of teaching and research in industrial hygiene in the Harvard Medical School.

In the present issue there is a very interesting article entitled "Telephone Operating, a Study of its Medical Aspects," by Dr. Anna Richardson, physician of the New England Telephone and Telegraph Co. This article shows how telephone operators are selected by the company, and how well the care exercised in this selection is repaid in efficient service. For example :—

"Very careful studies have been made by skilled engineers, watching conditions in an exchange, and listening in on positions, to note every possible variation in an individual's work in order to determine what proportion of time an operator can work well—*i.e.*, render the best service to the public with the fewest possible errors and with the least possible physical and nervous strain. In this way standards have been established which are technically called 'ouds.' These vary for different types of operators."

Wireless Telephony.—A successful demonstration of wireless telephony was given on Monday by the Royal Air Force in one of the Committee Rooms of the Houses of Parliament. According to the *Times*, General Seely stated that the Air Force took up the subject early in 1915, and by March, 1918, the first two squadrons of aeroplanes had been fitted with the apparatus, which gave them such an advantage that German machines took care to avoid them. The postal aeroplanes, such as those plying between Kenley and France, are now so fitted. Ranges of 100 miles from an aeroplane and of 165 miles from an airship have been obtained, and could be increased by the use of larger aerials at the receiving stations, if any good purpose would be served thereby. Improvements still remain to be effected, such as the elimination of the trailing aerial on the aeroplane, and of the need of switching over between sending and receiving, which makes the interchange of conversation not quite so easy as it is with an ordinary telephone. It is noteworthy that no evidence has been obtained to suggest that the Germans had developed wireless telephony.

An effort was made to explain thermionic valves, but the members and others present listened with more attention to the actual results of the demonstrations. Two valves were arranged to amplify the signals, with the result that they were audible all over the room. Some music played by a gramophone was transmitted from Aperfield Court, some 20 miles away, an aircraft ground receiving station being employed for the purpose, with a temporary aerial erected on the roof of the Houses of Parliament. Some conversation was then interchanged with Aperfield.

Communication was next established with aeroplanes sent up from Biggin Hill aerodrome. At first it was "jammed" by the Admiralty or some other intruder, but later the observer of a Nieuport machine was heard. Two machines gave their positions, one of them being at a height of 8,000 ft.

Another part of the demonstration concerned direction-finding by wireless for the navigation of aircraft. A coil was on view, and by its aid signals were picked up from the Eiffel Tower, a portion of a message received announcing itself as being an "order particularly for Buda-Pesth."

An intercommunication telephone was also shown by General Seely. Worn on the neck of a member, with a wire-connection down the trouser leg, it would enable him to speak to all the world—an unrivalled opportunity for propaganda.

Legal.—McCourt *v.* Belfast Corporation.—At the Belfast Assizes an action was brought against the Belfast Corporation by Leo McCourt, a minor, to recover damages for personal injuries through the alleged negligence of the Corporation in the control of an electric section-box, by wrongfully placing and keeping it open in the public street in a dangerous condition. Plaintiff was 15 years of age. While standing with others looking at a section-box, the telephone door of which was lying open, he was pushed forward, and his hand went through the open door and came in contact with the live wire; his hand was burned and a finger rendered useless. For the defence, it was stated that the box had been forced open, and an empty milk-tin and a piece of iron were inside the box. Children had been larking, either expecting to stop the car system or to shock some passing cows. Verdict for the Corporation.

Housing in London.—The Ministry of Health announces that a Conference was held, last week, at the Ministry of Health, between Dr. Addison and the London Housing Board—Sir Tudor Walters, Sir Kingsley Wood, and Mr. Strauss—and the Mayors and Town Clerks of the Metropolitan Borough Councils. The Conference was called to consider the adoption of special measures for the conversion of houses into working-class flats. The Minister put before the Conference a number of proposals for expediting measures and for taking special action where this is desirable in order to secure as early results as possible. Steps have been taken to put the proposals into immediate operation.

This announcement is of some interest to electricity supply authorities in Greater London, who should not lose sight of the desirability of watching this housing conversion work. Much of it should afford them possibilities for lighting and cooking business, whilst the knowledge that electricity would be employed should certainly assist architects in cutting and adapting existing houses.

British Trade in China.—A meeting of the Empire Trade and Industrial Committee of the Royal Colonial Institute was held July 25th, at which Prof. C. A. Middleton Smith, of Hong-Kong University, made an interesting statement on British trade prospects in China. He emphasised the fact that all that was needed in that huge undeveloped market of 400 million people was education, in order that they might learn the uses of manufactured goods, after which the demand for them would necessarily follow. Further, to foster this it was very necessary that people in this country should pay attention to such matters as communications with the Far East and systematic propaganda in China in favour of British interests. During the discussion, says the *Financier*, a matter which was touched on was the infringement by Japanese firms of British trade marks in China. We have no agreement with China in this respect, and it is said that a great deal of this infringement goes on, although representations are being constantly made on the subject.

Engineering Golfing Society: Match Play Tournament.—The final round of this tournament was decided on August 5th, when Mr. B. J. Hall defeated Mr. F. A. Nixon by 6 up and 4 to play in a 36 hole match on the Old Ford Manor links. The entries were not quite so numerous as before the war, but Mr. Hall has had to play six matches, and in the fourth round only succeeded in securing victory over Mr. W. E. Lane at the 26th hole.

Radium Store.—It is stated that England to-day possesses probably the largest quantity of radium ever collected. This store weighs about 3 grammes, and as one-thousandth part of a gramme costs over £30, the total value is about £100,000. This supply, secured in the first instance for war purposes, is now to be given over to the British medical profession.

Daylight Saving in America.—President Wilson's veto of the Congressional attempt to repeal daylight saving and the failure of the House to pass the measure over his veto settles the fate of this summer-time practice probably for another year. "The only avowed opponents of the practice," says the American *Electrical Review*, "are the farmers. . . . We are convinced, however, that the great majority of the country's citizenship is heartily in favour of daylight saving every summer. Electric lighting companies are sufferers from it, but almost without exception they are glad to bow to what is manifestly for the public good." Our contemporary reports that during the daylight saving season last year the Edison Electric Illuminating Co., of Boston, saved 4,420 long tons of coal because of the extra hour of daylight utilised. The decrease in KW.-hours from this cause was 5,000,000, representing a loss of revenue of about $350,000.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Central Station & Tramway Officials.—The St. Marylebone Borough Council has approved the following changes in respect of the senior officers of the electricity department:—

Mr. F. B. LEONARD, hitherto acting chief assistant engineer at an inclusive salary of £630 per annum, becomes chief assistant engineer at £650 per annum, including bonus.

Mr. F. SELLEY, previously assistant mains engineer, becomes mains and sales engineer at £400 per annum, *plus* the addition to which he is entitled under the awards relative to electrical engineers. The combination of the mains and sales sections, effected as a war measure at the end of 1917, is thus continued owing to its economy and general advantages.

Mr. W. HARPER, accountant, will have the supervision of all tariff proposals, hire and maintenance agreements and general correspondence, in addition to his present duties as accountant. His designation has been amended to chief clerk and accountant, and his salary increased from £350 to £400 per annum, *plus* the bonus to which he is entitled under the award relative to civil servants.

Mr. P. H. MILTON, assistant accountant, will relieve Mr. Harper of the supervision of the detail of the whole of the accountancy work, and his salary has been increased from £300 to £325 per annum *plus* the bonus to which he is entitled under the award relative to civil servants.

Mr. H. E. MORTIMER has been promoted from assistant mains engineer to consumers' engineer at a salary of £5 per week, *plus* the bonus to which he is entitled under the awards relative to electrical engineers.

Mr. CHAS. W. SALT has now taken up his duties as city electrical engineer at Carlisle. On the Saturday before his departure from Torquay (August 2nd) he was presented with a companion case of pipes by the staff and workmen of the department, the senior engine driver, Mr. G. Courtier, making the presentation. Mr. Salt, in responding, appealed to the men to be loyal to his successor as they had been to him. The officials of the Torquay Town Council presented Mr. Salt with a beautifully engraved cigarette box.

A heated discussion took place on August 5th at Blackpool Town Council on a recommendation to increase the salary of the electrical engineer and tramways manager (Mr. FURNESS) from £900 to £1,250, also to raise the salaries of the Town Clerk and others. Councillor Tomlinson strongly objected to the proposed increases to officials of departments when at the same time they were increasing tram contracts and the price of gas and electricity. He said that considering the amount of unrest in the country it was a scandalous shame to recommend such increases. When the amendment to refer the matter back for four months was submitted it was defeated by 27 votes to 20, so that the minutes were adopted.

Crewe T.C. has increased the war bonus of the Electrical Engineer by £50 as from April 1st last.

Hebden Bridge U.D.C. has increased the salary of the Electrical Engineer (Mr. H. H. SUTCLIFFE) to £275 a year, the war bonus being discontinued.

Oldham T.C. has increased the salary of the Electrical Engineer (Mr. F. L. OGDEN) from £450 to £700 a year; that of Mr. W. CHAMBERLAIN, tramway manager, from £450 to £700; and that of Mr. R. HERBERT, assistant mains engineer, from £3 13s. 7d. to £4 5s. per week, these including a bonus of £60 per annum.

Mr. P. H. WRIGHT has resigned his position with the Yorkshire Electric Power Co. as assistant engineer and draughtsman in the Station Construction Department and has taken up a position on the engineering staff of Messrs. Rowntree & Co., Ltd., York.

Mr. J. WILLIAMS has resigned his position as chemist and superintendent of the testing department with the Yorkshire Electric Power Co., which he has occupied for the last six years, and has been appointed technical assistant to the Borough Electrical Engineer, Salford.

Doncaster Tramways Committee has accepted with great regret the resignation of Mr. E. S. RAYNER, borough electrical and tramways engineer, who has been appointed general manager of tramways at Hull.

Mr. ARTHUR ARNOLD, who returned to the Yorkshire Electric Power Co. after serving as engineer-lieutenant, R.N., has now left that company to take up an appointment in London.

Dartford U.D.C. has appointed Mr. G. H. BROWNE, of Huddersfield, as electrical engineer at £500 a year, subject to his acting, if required, as engineer and manager of the light railways at the expiration of the agreement with the Bexley U.D.C.

Whitby U.D.C. has increased the salary of the electrical engineer (Mr. J. W. PIGGOTT) to £300 a year.

Chesterfield T.C. has granted Mr. W. A. TOPPIN a bonus of £200 for his services from the time of Mr. Acland's resignation to the appointment of his successor, and has appointed him assistant general manager of the electricity and tramway undertakings at £300 a year, plus £120 a year war bonus.

Mr. EDGAR MOXON, deputy borough engineer for Blackburn, who has been appointed borough electrical engineer at South Shields, will take up his new duties by the end of this month. He received his first training under Mr. A. B. Mountain, then engineer for Huddersfield, and after rising to the position of mains engineer went to Blackburn. During the 15 years he spent with the Blackburn Corporation he rose to be deputy engineer.

Mr. J. DOBSON, general manager of the Gravesend and Northfleet Tramways and the North Kent Motor Service, has been appointed general manager of the Southampton Corporation Tramways at £700 per annum.

It was explained to Blackburn Council on August 7th that Mr. P. P. WHEELWRIGHT, electrical engineer, had given voluntary service in connection with the manufacture of munitions at the Electricity Works during the war. Out of former profits of £15,000 he was granted a bonus of £500. There has been a further profit of £8,000, and a committee was appointed to consider whether he should receive a further bonus.

The Hereford T.C. has increased the salary of the Electrical Engineer by £200 a year.

Mr. H. F. G. WOODS, A.M.I.Mech.E., A.M.I.E.E., resident engineer at the Yorkshire Electric Power Co.'s Barugh Power Station, near Barnsley, has been appointed borough electrical engineer and manager at Torquay. There were 105 applicants for the position.

General.—According to a Birmingham paper a movement is no foot to form a committee to consider the raising of a testimonial to be presented to Sir Oliver Lodge, who retires from the Principalship of Birmingham University at the end of September.

Mr. THOMAS PRATT, head of Christopher Pratt & Sons, Ltd., electrical contractors, Bradford, and president of the National Chamber of Trade, was returned unopposed, last week, as a member of the Bradford City Council.

Mr. JEREMIAH RING, supervisor of the Valencia, County Kerry, Cable Station, has retired on superannuation, after 45 years' service. On the occasion of his retirement he was entertained by the staff of the Cable Station, and was presented with a gold watch.

Mr. H. ELLIOTT, who is at present chief engineer to the Ship Canal Cement Works, Ellesmere Port, and was previously under the Carlton Main Colliery Co., Ltd., near Barnsley, has been appointed chief mechanical and electrical engineer to a large group of collieries in India.

Mr. W. T. HELLABY, who has been for over five years assistant sales manager to the Sunderland Corporation Electricity Department, and who has recently been demobilised from the R.A.F., has taken up a position as engineer to Messrs. Handley & Robinson, Ltd., electrical engineers, Birmingham, who have equipped works at 106, Lionel Street, Birmingham, for carrying out repairs to electrical plant and armature rewinding of all types.

Birthday Honours.—In the further list of Birthday Honours announced this week we observe the name of Mr. JAMES WALLACE PATON, J.P., Mayor of Southport, 1908-9, upon whom the honour of Knighthood is conferred in recognition of his public services. Sir James is chairman of the Silent Electric Clock Co.

Major JOHN THEODORE PRESTIGE, a director of J. Stone & Co., Ltd., of Deptford, is also made a Knight.

Obituary.—MR. MARK RUDDLE.—We regret to record the death of Mr. Mark Ruddle, which occurred at his residence in Dublin. Mr. Ruddle was for 28 years associated with the Dublin Municipal electricity system, and only a few months ago resigned, for health reasons, the position of city electrical engineer. A native of the Irish Metropolis, Mr. Ruddle was a pupil of the late Mr. George Porte, M.R.I.A. He became engineer and manager of a large chemical works at Portsmouth, and subsequently joined the Bell Telephone Co., which, in 1880, amalgamated with the Edison Co., New York. The directors of the Edison Syndicate appointed him one of their London engineers, and the first underground cable system was laid under his direction. He also acted as engineer to the Syndicate in Manchester. When the Dublin Corporation decided upon the installation of an electrical system, Mr. Ruddle was appointed chief of staff.

Engineering records the death on July 11th in America, at the age of 72 years, of Mr. Samuel T. Wellman, one of the founders of the Wellman-Seaver-Morgan Co., of Cleveland, Ohio, and a director of Wellman, Seaver & Head, Ltd., London.

Lieut. S. E. S. MACCLEOD, wireless officer of the flying boat *Felixtowe Fury*, was drowned owing to the wreck of the boat during a test flight on Monday.

MR. R. B. JOYNER.—We regret to read in the daily Press that the death is announced by cable from India of Mr. Robert Batson Joyner, C.I.E., M.Inst.C.E., who had been engaged in engineering work in the Bombay Presidency for 52 years. Of this period thirty years were spent in the service of the Government, and on two occasions he received the thanks of the Government for the part he played in connection with important public works. He was responsible for large irrigation projects, and after retirement from the Government service was appointed consulting engineer of the Gokak Water Power Company. Perhaps his greatest, as also his most recent, piece of engineering work was performed in connection with the designing and construction of the Tata Hydro-Electric Works, Bombay. Last November a full account of this undertaking was given in a paper contributed by him to the Institution of Civil Engineers in London. Several months ago he was awarded a Telford gold medal and an Indian premium for this paper. Mr. Joyner was 75 years of age.

MRS. A. C. HUGHES.—We regret to record the death, which occurred on July 22nd, at the great age of 94 years, of Mrs. Anna Chadbourne Hughes, widow of Professor David Edward Hughes, of London.

MR. J. B. CONCANON.—We regret to note that Mr. James Blake Concanon, who was chairman of the Anglo-Argentine Tramways Co. and a director of Brisbane and other electric tramway concerns, passed away at 98, Piccadilly, London, W., on August 12th, after a long illness, at the age of 69 years.

NEW COMPANIES REGISTERED.

Willis & Moncrieff, Ltd. (157,797).—Private company. Registered August 8th. Capital, £5,000 in £1 shares. Objects: To carry on the business of manufacturing opticians, mechanical engineers, tool makers, metal and glass workers, ironmongers, electricians, manufacturers of lenses, telephones, telegraphs, kinematographs, spectacles, telescopes, microscopes, meters of all kinds, anatomical, orthopædic and surgical instruments, &c., and to adopt an agreement with T. S. Willis and J. Moncrieff. The subscribers (each with one share) are: T. S. Willis, 29, Hazelbank Road, Hither Green, S.E., manufacturing optician; J. Moncrieff, 26, Mathews Park Avenue, Forest Gate, E.15, manufacturing optician; T. F. Miller, Fore Street, E.C.2, C.A. The first directors are T. S. Willis, J. Moncrieff and T. F. Miller. Qualification, £1. Registered office: 32a, St. Mary's Road, Plaistow, E.13.

Colleys, Ltd. (157,801).—Private company. Registered August 8th. Capital, £35,000 in £1 shares. To carry on the business of manufacturers of tramway and other printed tickets, telegraph coils, toilet paper, &c., and to enter into an agreement with Colley's Patents, Ltd., and its liquidator. The subscribers (each with one share) are: J. Holland, 438, Union Street, Aberdeen, paper maker; H. Becker, 17, Lancaster Park, Richmond, S.W., manufacturing stationer; C. V. Fisher-Rowe, 3, Tite Street, S.W., stockbroker; W. W. Colley, 3-12, Marine Street, S.E., roll paper manufacturer; F. E. R. Becker, Sutton Hall, near Hounslow, wood pulp manufacturer. The first directors are W. W. Colley, C. V. Fisher-Rowe, J. Holland, H. Becker and F. E. R. Becker. Registered office: 3-12, Marine Street, Bermondsey, S.E.

Electrical and Magnetos, Ltd. (157,690).—Private company. Registered August 5th. Capital, £2,000 in £1 shares. To carry on the business indicated by the title. The subscribers (each with 10 shares) are: W. L. Jenkins, 11, Naes Street, St. Thomas, Swansea, motor engineer; G. E. Fox, York Street, Swansea, electrical engineer. Registered office: 11, York Street, Swansea. Solicitor: E. Harris, 3, Fisher Street, Swansea.

H. D. Symons & Co., Ltd. (157,614).—Private company. Registered August 1st. Capital, £15,000 in £1 shares. To carry on the business of manufacturers of and dealers in insulating materials, merchants, importers and exporters, commission agents, shippers and shipping agents, factors, manufacturers of and wholesale and retail dealers in metals, alloys and metallic compounds of all kinds, electrical, motoring, engineering and scientific accessories and appliances, &c., and to adopt an agreement with E. R. Good, P. Good and H. D. Symons. The subscribers (each with one share) are: H. D. Symons, Lonsdale, Broad Road, Sale, Cheshire, electrical engineer; E. R. Good, Dogmersfield, South Woodford, Colonial merchant; H. Good, Dogmersfield, South Woodford, chemist; P. Good, 1, Vincent Square, S.W.1, engineer. The subscribers are to appoint the first directors. Qualification, £100. Solicitor: A. M. Oppenheimer, 31, Queen Victoria Street, E.C. Registered Office: Park Works, Park Road, Norbiton, Surrey.

Splitdorf Electrical Co. of London, Ltd. (157,628).—Private company. Registered August 1st. Capital, £10,000 in £1 shares. To enter into an agreement with the American Supplies Co., Ltd., and to manufacture and deal in ignition apparatus and machinery for the ignition of internal-combustion engines and appliances. The subscribers (each with one share) are: C. E. Rorabacker, 6, City Road, E.C., managing director, American Supplies Co., Ltd.; F. J. Hinley, 102, Great Portland Street, W., manager, American Supplies Co., Ltd. Directors: C. E. Rorabacker and H. J. Hinley. Solicitor: W. R. J. Hickman, 11, Ironmonger Lane, E.C.2.

Direct Electrical Co., Ltd. (157,609).—Private company. Registered August 1st. Capital, £1,000 in 900 ordinary shares of £1 each and 2,000 deferred shares of 1s. each. Electrical and mechanical engineers, plumbers, carpenters, gasfitters, buyers and sellers of all kinds of electrical and mechanical apparatus. Agreement with D. H. C. Higgins and J. Dunkley. The subscribers (each with one share) are: L. E. Phillips, 25, Elm Road, East Sheen, S.W.14, solicitor; B. Davies, 45, Dartmouth Road, Hendon, N.W.4, solicitor's clerk. The first directors are: D. H. C. Higgins, 32, Meadway Court, N.W.4; J. Dunkley, 46, Devonshire Road, Merton, Surrey, S.W.19. Registered office: Staple Inn Buildings, 325, Holborn, E.C.

T. B. S. Electrical Construction Co., Ltd. (157,594).—Private company. Registered July 31st. Capital, £1,000 in £1 shares. Objects: To carry on the business of electrical engineers, constructors and contractors, dealers in and agents for electric plant, supplies, lamps and bells, contractors for the erection and maintenance of generating plant and installations in private houses, &c. The first directors are: R. Brown, South View Cottage, Silverdale, Lancs.; G. F. Stagg, 171, Shooters Hill Road, Blackheath; A. R. Tree, Wey View, Weybridge, Surrey. Solicitor: G. A. Martin, 6, Guildhall Chambers, E.C. Secretary: A. R. Tree. Registered office: 68, Victoria Street, S.W.

Mersey Electrical Engineering Co., Ltd. (157,620).—Private company. Registered August 1st. Capital, £1,000 in £1 shares (100 founders'). To carry on the business indicated by the title. The subscribers (each with one share) are: N. Trant, Belmont Terrace, Nestor, Cheshire, electrical contractor; J. Sumner, 60, Litherland Road, Bootle, electrical contractor. The first directors are N. Trant (managing director) and J. Sumner (permanent governing directors, subject to holding 25 founders' shares). Secretary, A. J. Cookson, 14, Pembroke Road, Liverpool. Registered office: 15, Old Post Office Place, Liverpool.

CITY NOTES.

Electro Magneto Motors, Ltd.

At an extraordinary general meeting, held on August 7th, at 14, Devonshire Square, E.C., Mr. A. G. Meissner presiding, resolutions were adopted sanctioning the conversion of the company from a private into a public undertaking, and increasing the capital to £12,000 by the creation of 40,000 ordinary shares of 1s each. As reported in the financial Press, the chairman mentioned that the invention which the company was formed to develop was "approaching consummation," the inventor, Mr. Suchostawer having reported that he would be in a position to give practical demonstrations with his new electric motor in the near future. "It is claimed by the inventor . . . for his engine, which has been designed on entirely new principles, based on the magneto idea, that it will run on its own power, and will supply surplus energy. That, of course, is a claim implying a revolution in industry, and even in economics." . . . "The conversion of our undertaking into a public company will place us in a better position to deal with the impending important developments to which we are now able to look forward." Later, the chairman said that the 40,000 shares would be issued at a substantial premium, and only as the circumstances of the company required.

Lisbon Electric Tramways, Ltd.

Net profit for 1918, £8,094, plus £3,135 brought forward, making £11,229 to be carried forward to 1919. £10,000 has been transferred from the exchange reserve to the depreciation account to meet this year's appropriation. The tramways carried 80,806,364 passengers, with receipts of Es.3,523,069, as compared with 79,434,362 passengers, and receipts of Es.2,754,964 in 1917. Working expenditure continued to grow without interruption owing to higher cost of supplies and increased wages. The slight relief in price of fuel experienced toward the end of 1918 was too late to materially affect the result of the year's working. Working expenditure advanced by £97,933 over the abnormally high figure of 1917. As local affairs in Lisbon had been very unsettled, no satisfactory adjustment of the question of the tariffs with the Government and the municipality had been possible. It was hoped that during the current year some equitable arrangement might be concluded whereby they would secure a sufficient increase of revenue to meet the constantly increasing working costs.

German Companies.

The Deutsche Magneta A.G., of Cologne, makers of electric clocks, reports net profits of £800 for 1918, as against £700 in the preceding year, the amount being carried forward in each case.

The accounts of the *Dr. Paul Meyer A.G., of Berlin*, after writing off £9,000 for depreciation in 1918, as compared with £8,000 in the previous year, show net profits of £21,000, as against £24,000 in 1917. It is proposed to pay a dividend of 10 per cent., being the same rate as in 1917.

The Elektrometallurgische Werke Horrem A.G., of Frankfort-on-Main, which company is closely associated with the Griesheim-Elektron Chemical Co. and the Metal Bank and Metallurgical Co., reports loss of £2,600 for 1918. This result increases the deficit to £19,000 on a share capital of £175,000.

The Elektro Treuhand A.G., of Berlin, which was originally formed by the Siemens & Halske Co. and the Siemens-Schuckert Co. to finance electrical undertakings, reports receipts from bank interest and dividend on the Hamburg Elevated Railway shares amounting to £59,000 for 1918, as contrasted with £58,000 in the previous year. After paying interest on loans the net profits and balance forward are returned at £37,000, as against £34,000 in 1917, and the dividend is at the rate of 5½ per cent., being the same as in 1917.

The Continentale Ges. fur Elektrische Unternehmungen, of Nuremberg, which owns and works supply undertakings and tramways, states that it was only possible in 1918 to proceed with extensions and new schemes to a moderate extent owing to the enormous advance in prices. The net profits reached £60,000, as against £50,000 in 1917, and a dividend at the rate of 3 per cent. has been declared on the preference capital, as in the previous year, whereas the £43,000 of ordinary shares again receive no distribution.

The directors of the *C. Lorenz Telephon und Telegraphen Werke, of Berlin*, report gross profits of £157,000 for 1918, as compared with £154,000 in the preceding year. After writing off £95,000 for depreciation, as against £53,000, the net profits amount to £62,000, as contrasted with £101,000, rising to £84,000 by the appropriation of the second reserve fund. The dividend and bonus total 22 per cent., this comparing with 35 per cent. in 1917. It is mentioned that the transition from war to peace work has been accomplished by drawing upon £40,000 which had been set aside for this purpose.

Pernambuco Tramways and Power Co., Ltd.

Mr. Follett Holt, presiding at the annual meeting in London,, on August 7th, said that 1918 was a very difficult period. Gross revenue continued to expand; it had nearly doubled during the past four years, but the high prices of fuel and stores swallowed up the whole of last year's gross increase. The net result would have been considerably better but for a paralysing attack of influenza extending over two months. The total net receipts were practically the same as for 1917. After putting £10,229 to capital reserve and £10,000 to renewal and reserve, and £1,500 to amortisation, 3½ per cent., less tax, was recommended on the preference shares (7 per cent. non-cumulative partic.). The telephone company in which they had a substantial interest was making good progress, and now gave them a return on their investment. After the telephone concession had been revised they hoped to give Pernambuco a first-class service. The tramway concession was extended by ten years under the new contract. To complete the system more capital was required. After consultation with their English and French financial friends they asked the shareholders for borrowing powers of £500,000. The meeting duly approved.

The Aabada Trust, Ltd.

It was stated at a meeting held last week that the profit for the year ended at March last was £8,710, and after deducting expenses a dividend of 5 per cent was to be paid. Mr. H. Robertson, who presided, referred to the fact that prospects in respect of the original assets of the trust were now very favourable for turning them into liquid cash at a satisfactory profit. He referred to the technical qualifications of Mr. C. S. Colton, the managing director, and to the intimate associations which another director, Lieut.-Col. Francis E. Drake, had with the electrical world; the latter was negotiating important matters whereby the trust would secure the European rights in some inventions already successful in America. The concern was laying itself out specially for handling matters connected with the engineering and electrical world. Mr. Colton, in addressing the meeting, said that they had succeeded in placing an American electric meter with a large concern in this country at a substantial profit; they also had an important interest in a new dry battery "which had proved itself superior in working to any other battery at present offered in the market." A large electrical concern was taking over the manufacture of that battery for sale throughout the British Empire, except in Canada. They had also acquired a 50 per cent. interest in a new wireless system, so far as the Western Hemisphere was concerned. They also had a 50 per cent. interest in an electric piano player, and they had made an arrangement with a well-known electrical engineer in Rio de Janeiro which would make the trust his representative and purchasing agent in Europe on a 5 per cent. basis.

Marconi's Wireless Telegraph Co., Ltd.

Mr. Godfrey C. Isaacs, deputy chairman and managing director, presided on Thursday last week over the meeting of the company held at the Savoy Hotel. In proposing the adoption of the report, he said that the net profit for the year amounted to nearly £598,000, which was approximately £215,000 more than in 1917. A dividend of 7 per cent. had already been paid on the preference shares, and an interim dividend of 5 per cent. on the ordinary shares. It was now proposed to pay a final dividend of 20 per cent. upon the ordinary shares and 15 per cent. upon the preference shares, to transfer £150,000 to the general reserve, and to carry to the next account the sum of £463,786. He thought those figures would be regarded as highly satisfactory, for while there was no doubt that they had benefited from the war in some respects, their progress had been very considerably retarded in other directions, particularly in the development of foreign telegraph services. Having referred in detail to the progress of the affiliated companies, in regard to which he said that taking all things into consideration they had not too much reason to complain, he stated that a company had been formed in China under charter notified to the British Legation. The company had a nominal capital of £700,000, which was to be subscribed as and when required conjointly in equal moieties by the Chinese Government and their company. There were other companies in the course of formation in other parts of the world, about which he hoped to be able to say more next year. In regard to the Canadian Co., that had been reconstructed, and Mr. Arthur H. Morse, who had been appointed managing director, was now on his way to take up his duties. He would be surprised and disappointed if they did not see a marked improvement in the development of that company. In Italy they had continued to do a substantial business, and the Spanish Co. continued to make good progress, and already there was promise of a much larger traffic than in pre-war days. Since the outbreak of the war the Argentine Co. had been obliged to mark time, but all preparations were now being pressed forward to complete the erection of a high-power station near Buenos Aires and another in this country for the conduct of a direct telegraph service at reduced rates. In dealing with their interests abroad, he wished to acknowledge the very valuable assistance which had been afforded them by the Foreign Office. Proceeding to refer to the home business, Mr. Isaacs said he was sorry to once more have to tell them that they had not been able to arrive at any settlement with the Postmaster-General in respect of the services which the company had rendered during the war. It was a record of which the company had every right to be proud, and which not only the shareholders but the people of the whole Empire would warmly applaud could the book be opened. Despite that they had not been able to obtain anything approaching what they deemed a reasonable offer for the work which they had done, for which payment could and should be made. They had asked the Post Office to pay them for the 80,000,000 words which they intercepted and reported day and night since the outbreak of war to sometimes as many as 40 different addresses directed by the Government. That work was done under the most difficult of circumstances, either under direct instructions from the Government or at the company's suggestions, made as the result of its observations of altered enemy tactics. Enemy fixed and portable stations, naval stations, comprising service ships, submarines, and aircraft had all had to be dealt with. They designed entirely new receiving apparatus to meet the continually changing circumstances and counteract enemy activities. Some of the ablest of the company's engineers devoted their whole time to that work. The nature of the interception work, owing to the absence of facilities for calling for repetitions, was very difficult, particularly when it was borne in mind that half of the traffic was in cypher. But they were further handicapped by the absence of knowledge as to which stations would be sending messages or with what wave-lengths they would work. Yet everything was carried out to the complete satisfaction and appreciation of the Government departments served. Upwards of 8,000,000 words were in foreign languages, including Russian, German, Italian, French, and Rumanian. All those messages were translated by them and delivered to the numerous addresses designated to them by the authorities. Since their stations were returned to them after the armistice they had been conducting work of a somewhat similar nature, but a much simpler and easier one, for another Government department. After consideration that Government department fixed 3d. per word, which was what they deemed to be a reasonable rate of pay for the nature of the work which they were doing. They accepted what the Government department considered reasonable. But for the much more difficult and onerous work which he had just described, and for which they had to look for payment to the Post Office, they had not been able to obtain an offer of more than what amounted to approximately one and one-fifth of a penny per word. And this was not only offered to them as remuneration for their services, but it was to cover also compensation for their having been deprived of the use of the whole of their stations except Clifden during the whole period of the war. That one and one-fifth of a penny per word left but a very small margin over and above their actual out-of-pocket expenditure. They had made many attempts to arrive at a reasonable settlement, and had offered to accept terms substantially less than those which they were being paid and to which he had already referred. They would have willingly made that sacrifice in order to ensure the good relations which it was the company's aim to maintain with all Government departments, but all to no avail. In those circumstances, as painful as it was to have to sue a Government department under Petition of Right, they would not be surprised that they had again been driven to commence new proceedings and were threatened once more with being forced into a Court of Law, expending large sums in legal costs, and wasting the time of the important officials of the company, whose whole energy and time were required successfully to run the vast machinery of their world-wide organisation. The chairman then dealt at some length with the recent proceedings between the company and the Post Office regarding the contract for the Imperial chain of wireless stations. He criticised very severely the way in which the Post Office had attempted to prove their case, especially in putting forward the contention that they could use a Poulsen arc for transmission for the Empire chain of stations, and could otherwise do without Marconi patents. For this purpose he said they desired to call a French Government witness. The first step towards obtaining the French Government's assistance was taken by a Member of Parliament, who was primarily responsible for the delay in the construction of the Imperial chain of stations in 1912. The French Government with courtesy could not refuse to send over the officer in charge of the Eiffel Tower station to give evidence. He came over and was interviewed by the Post Office representative, but was not called as a witness. The reason for that was that the witness would not give the evidence that the Post Office required of him; he would have disproved their case. He was here for three days and returned to Paris; but, nothing daunted, the Post Office persisted in its contention. Fortunately they had private knowledge of the incident, and they called the French official evidence, which proved the following points: (1) that the French Government had considerable experience of long-distance telegraphy; (2) that Poulsen arcs had proved a failure for commercial wireless telegraphy; (3) that the Poulsen arcs were being superseded in French stations by up-to-date inventions, which had proved to be far more efficient; (4) that the French Government could not build stations for commercial purposes without using the patents of the French company; (5) that the French company had the right of use of the Marconi Co.'s patents, and the Marconi Co. owned the British rights of all the French company's patents. The Post Office completely failed to make out their case, and

even their own witness, Mr. Swinburne, an eminent scientific expert, said that the Marconi Co. had made great improvements in wireless telegraphy in recent years, and still led the world in the development of the art. Having referred to the terms of the award, Mr. Isaacs said that one would have thought that if the Post Office and the company had failed to arrive at an agreement in consequence of a genuine divergence of opinion as to the value of the contract, one might have hoped and expected that the learned judge's award would have opened the way to a simple and straightforward course in the interests of the country. Instead of doing that, however, the Post Office went to Parliament for a supplementary vote of £170,000, and they caused an official announcement to appear in the *Daily Mail* to the following effect: "The Post Office engineers are installing a system which they say is free of all existing Marconi patents, and no royalties will be payable to the Marconi Co." He said without hesitation that that could not be done, and after the hearing in the case before Mr. Justice Lawrence the Post Office must know it could not be done. The Post Office engineers admitted that they knew little or nothing about long-distance wireless telegraphy, and had had no experience of it. They were going to start building the Imperial stations by experimenting with obsolete systems. The Post Office thought that the art as it was known in 1904 was good enough for the British Empire. Would the British public think so? Would that watertight Government department be allowed to adopt that suicidal policy, and in its ineptitude raise the price of telegrams to cover its failure, as it was proposing to raise the price of telephones? The crux of the whole question was that there should be no royalties for the Marconi Co. He believed that the evidence was sufficiently conclusive to prove that a genuine divergence of opinion was not the cause of their failing to arrive at an agreement. Was it not clear that there was something else behind that inexplicable conduct of the Post Office? He said emphatically that had the Post Office wanted to arrive at an agreement there would have been no petition of right, no arbitratoin, and no award. Their conduct and attitude ever since Mr. Herbert Samuel left office had been inexplicable, and had resulted in a great waste of public money. Before more money was squandered upon Imperial stations he demanded that an inquiry should be held to investigate the extraordinary procedure of the Post Office, and elicit on whose guilty shoulders lay the responsibility for their attitude with regard to the Imperial chain of stations. He spoke with feeling, for should personal enmity of an individual at the Post Office exist against any individual of that company, he said emphatically that he was failing in the sacred trust he held in allowing his animus to stand in the way of the interests of the country. There was something rotten in the state of the Post Office which demanded investigation. The amount of the award was received two days ago, but the directors did not at present propose to touch it; they proposed to wait a little. Ere long they would have to call the shareholders together to consider an increase in the capital. They had considerable developments in view, for which provision must be made, and there might be more within the next few weeks. They required a little more time for consideration, and they might know better where they stood when they met the shareholders again in the autumn.

Capt. Riall Sankey seconded the motion, which was carried without discussion.

Kidderminster & District Electric Lighting & Traction Co., Ltd.—The report for 1918 states that the agreement authorised to be entered into with the Shropshire, Worcestershire, and Staffordshire Electric Power Co. for the sale to them of the company's interests in the power station at Kidderminster had been duly executed, and the purchase price payable to the company—£32,911—had since been received, and would be applied towards the discharge of the company's liabilities. In addition, the Shropshire Co. have since the above date paid the sum of £11,658 to the Kidderminster & Stourport Electric Tramway Co. for their interests in the power station and freehold land in Kidderminster. An agreement has been made with the power company to manage the company's undertaking and to pay all revenue charges, including the dividend on the preference shares as from January 1st, 1918, and a dividend of 2½ per cent. per annum on the ordinary shares of the company as from January 1st, 1920, and thereafter so long as the company remain the owners of the electric supply undertaking.—*Financial Times.*

Babcock & Wilcox, Ltd.—The "Financier" states that extraordinary general meetings are to be held on September 1st and 17th to consider resolutions increasing the capital from £1,960,000 to £2,460,000 by the creation of 500,000 additional ordinary shares of £1 each; it is proposed to offer to the holders of ordinary shares registered on September 17th one new share for every four ordinary shares held, fractions being excluded. The new shares are to be offered at the price of £2 per share.

County of London Electric Supply Co., Ltd.—Interim dividends on the preference shares at the rate of 6 per cent. per annum, less income tax, for the June half-year, and on the ordinary shares at the rate of 5 per cent. per annum, less income tax.

Sydney Electric Light & Power Supply Corporation, Ltd.—For the half-year ended April, 1919, there is a profit of £19,255, against £16,274 for the corresponding period of 1918. Dividend 8 per cent. as before. New plant for the winter of 1920 is on order to meet extending business. Up to the present the increase in fuel, wage, and other costs has been met without increasing the charges to consumers, but this can hardly go on indefinitely.

W. T. Henley's Telegraph Works Co., Ltd.—Dividend on the preference shares at the rate of 4½ per cent. per annum, less income tax, for the June half-year; interim dividend on the ordinary shares of 6d. per share, less income tax.

Stock Exchange Notices.—The committee has ordered the undermentioned to be officially quoted:—

British Westinghouse Electric and Manufacturing Co., Ltd.—1,000,000 ordinary shares of £1 each, fully paid (Nos. 1,185,001 to 2,185,000).

Calcutta Electric Supply Corporation, Ltd.—Units sold to consumers during four weeks ended June 27th, 1919, were 2,608,749; the corresponding four weeks of last year, 2,519,004.

Coalite.—Resolutions for amalgamating the three Coalite companies were confirmed at meetings held in London last week.

Para Electric Railways & Lighting Co., Ltd.—Dividend 6 per cent. per annum, less tax, on the ordinary shares for the half-year.

National Boiler & General Insurance Co., Ltd.—Interim dividend 12s. per share, less income tax, on the ordinary shares for the half-year.

Oldham, Ashton & Hyde Electric Tramway, Ltd.—Interim dividend of 5 per cent. per annum, less tax, on ordinary shares.

Cleveland & Durham County Electric Power Co.—The accounts of this company for the year ended December, 1918, are given in full in the *London Gazette* for August 12th.

Walter Scott, Ltd.—Further dividend of 8¾ per cent., making 12½ per cent. for the year ended June 30th.

North Staffordshire Tramways Co., Ltd.—Dividend 5 per cent. for 1918; £592 carried forward.

Crossley Bros., Ltd.—Interim dividend at the rate of 6 per cent. per annum for the June half-year.

Blackpool & Fleetwood Tramroad Co.—Dividend 4 per cent.

STOCKS AND SHARES.

Tuesday Evening.

While in the industrial world there are certain symptoms of settlement—the children might cry "Touch wood"—the financial outlook is darkened by another plain warning from the Chancellor of the Exchequer that the country drifts steadily towards bankruptcy. The apparent exaggeration in the phrase robs it of its full meaning: it sounds picturesque, but not practical, except to the plain man who, with little voice in his country's spending, looks with troubled eyes at a situation which Mr. Chamberlain indicates as the Road to Ruin.

Stock Exchange business is quiet and rather uninteresting. Prices remain tolerably steady. The oil market commands a good deal of attention, though the roaring buoyancy shown in June and July has tamed somewhat. The Bill against profiteering is a subject of considerable discussion. If it is to prove of real service to the community, it stands to reason that many companies may be affected, but which, and to what extent, are real problems.

So much had been expected from the Marconi meeting, so many rumours had circulated with reference to what Mr. Godfrey Isaacs would say, that the event was discounted in advance, and the shares fell back as one result of the meeting. The bulls disliked the hints of possible further law-suits, and the price dropped 10s. to 5¾ before it steadied. Nevertheless, the chairman's speech might well have satisfied those who had any qualms as to what may happen when Marconi patents run out. Mr. Isaacs said that "very important discoveries have been made in respect of both wireless telegraphy and telephony in recent times, for which a number of new patents have been taken out and applied for." A number of the ablest and most experienced men in wireless telegraphy are continuously engaged in research and experimental work on behalf of the company.

Thus the Marconi patents are kept up to date, and they stand in the present balance-sheet at £80,500, which is not an extravagant sum. Shares in subsidiaries are taken into the balance-sheet for £1,365,000, which is substantially less than their market valuation. Mr. Isaacs referred at some length to the company's dealings with the Post Office, which seems to be the only Government Department where relations have been strained. Marconi Marines have eased off to 3¼, Americans and Canadians to 29s. 6d. and 16s. respectively. Marconi preference weakened to 4¾. Spanish remain about 13s. 6d.

Apart from Marconi shares, the telegraph and cable list is featureless. Indo-Europeans show no recovery after their sharp drop. The manufacturing group is disposed to decline.

Henley's went back to 2¼. The same tendency characterises other manufacturing varieties. British Insulated and British Westinghouse preference are both 1-16 down. Babcock & Wilcox shed 3-16, and this in spite of the long-expected "melon-cutting." The company offers shareholders half a million new shares at £2 each, in the proportion of one new for every four old. This provides, of course, a very useful bonus, but some, like Oliver Twist, had looked for more. The iron and steel share market is out of favour at present, and this affects engineering shares also.

General Electrics are now definitely dealt in as £1 shares, and are quoted at 2, the preference being 20s. in their new guise.

Electricity Supply shares continue weak. The coal position arouses anxiety. Falls of 2s. 6d. have occurred in Charing Cross, City of London, Kensington, London Electric and St. James' ordinary. There is no backbone in the market. To counteract the usual number of deceased accounts that come in for realisation, there is no public support, and, in the circumstances, prices have to be marked down even though no shares may change hands.

Underground Electric income bonds are harder at 96. Otherwise, the Railway market pursues the lower road, Districts and Metropolitans both being down. Foreign traction issues move in the same direction. Brazilian Tractions have lost 2 points. British Columbia Electric debenture is similarly down. Mexicans are flat once more, falls of one to two points occurring in the stocks and bonds of the Utility companies. There is no enterprise, no brightness. For these one has to go outside the Stock Exchange. Into the sunshine where, even now for instance, a boy's impatient voice shouts, "Put away that silly old writing, father, or we shall miss the boat for Sark!"

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price Aug. 11, 1919.	Rise or fall.	Yield p.c.
Home Electricity Companies					
Brompton Ordinary	10	8	6½	—	£6 10 6
Charing Cross Ordinary	4	4	2⅝	— ⅛	6 18 4
do. do. do. 4½ Pref.	4½	4½	3½	—	6 18 4
Chelsea	5	5	3⅛	—	4 16 0
City of London	8	8	11½	— ½	7 4 8
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	10½	—	6 18 3
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	6	8½	— ½	5 14 6
London Electric	Nil	Nil	1½	— ⅛	Nil
do. do. 6 per cent. Pref.	6	6	8½	—	7 14 10
Metropolitan	4	5	2⅝	—	8 18 8
do. 4½ per cent. Pref.	4½	4½	3⅞	—	7 1 2
St. James' and Pall Mall	9	10	6½	— ½	8 0 0
South London	5	5	2⅝	—	7 5 6
South Metropolitan Pref.	7	7	20/8	—	6 16 7
Westminster Ordinary	9	8	5⅜	—	7 2 3
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	95	—	6 5 6
do. Def.	1½	33/6	22½	—	7 8 0
Chile Telephone	8	8	6⅞	—	5 18 6
Cuba Sub. Ord.	7	7	10½	—	*6 13 4
Eastern Extension	8	8	15⅝	—	*5 4 0
Eastern Tel. Ord.	8	8	159½	—	*5 0 4
Globe Tel. and T. Ord.	7	8	15⅜	—	*5 5 10
do. do. Pref.	6	6	10⅜	—	5 18 6
Great Northern Tel.	22	22	28⅜	—	7 14 5
Indo-European	18	18	53½	— ½	6 18 2
Marconi	20	25	5¾	— ¼	4 7 0
Oriental Telephone Ord.	10	10	2½	—	4 9 0
United R. Plate Tel.	8	8	7⅞	—	*5 8 3
West India and Panama	1/8	1/8	1⅜	—	*4 11 0
Western Telegraph	8	8	16½	—	*4 18 9
Home Rails.					
Central London Ord. Assented	4	4	83½	—	6 6 0
Metropolitan	1	1½	24½	—1	5 2 0
do. District	Nil	Nil	22½	— ½	Nil
Underground Electric Ordinary	Nil	Nil	8	— ⅛	Nil
do. do. "A"	Nil	Nil	9/-	—	Nil
do. do. Income	4	5	96	+ ½	*5 4 8
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams. First Pref.	5½	Nil	3¾	+ ⅛	—
do. do. 2nd Pref.	—	—	2¼	—	—
do. do. 5 Deb.	5	5	68	—	7 13 10
Brazil Tractions	—	—	62	—2	—
Bombay Electric Pref.	6	6	11½	—	5 2 6
British Columbia Elec. Ry. Ptce.	5	5	56½	—	8 17 0
do. do. Preferred	Nil	2½	47⅞	—	5 5 8
do. do. Deferred	Nil	Nil	42½	—	Nil
do. do. Deb.	4½	4½	58	—2	7 8 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	58½	—	Nil
do. 6 per cent. Bonds	Nil	Nil	45¾	—	Nil
Mexican Light Common	Nil	Nil	85	—2	Nil
do. Pref.	Nil	Nil	48½	—2	Nil
do. 1st Bonds	Nil	Nil	69½	—1	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	9⅜	— 3/16	4 2 9
British Aluminium Ord.	10	10	1⅝	—	6 3 1
British Insulated Ord.	25	12½	2⅛	— 1/16	6 1 0
British Westinghouse Pref.	7½	8	2⅜	— 1/16	6 2 0
Callenders	25	25	9½	—	6 11 7
do. 6½ Pref.	6	6½	5¼	—	6 3 10
Castner-Kellner	25	20	2½	—	7 5 6
Edison-Swan, "A"	—	—	1⅜	—	6 0 6
do. do. 5 per cent. Deb.	4	5	75½	—	6 5 9
Electric Construction	10	10	1⅛	—	8 18 0
Gen. Elec. Pref.	6	6½	11	—	6 10 0
do. Ord.	16	10	22	—	*5 0 0
Henley	25	25	2¼	— ⅛	5 8 0
do. 4½ Pref.	4½	4½	2⅜	—	6 0 0
India-Rubber	12	12	17⅜	—	*5 15 1
Siemens Ord.	—	10	6¾	—	*7 13 9
Telegraph Con	20	20	25	—	4 17 0

*Dividends paid free of Income Tax.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Tuesday, August 12th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Oxalic per lb.	1/5	..
a Ammoniac Sal per ton	£80	..
a Ammonia, Muriate (large crystal) "	£78	..
a Bisulphide of Carbon "	..	..
a Borax "	£39	..
a Copper Sulphate "	£46	..
a Potash, Chlorate per lb.	1/3	..
a " Perchlorate "	1/3	..
a Shellac per cwt.	£22 10	50/- dec.
a Sulphate of Magnesia per ton	£15	..
a Sulphur, Sublimed Flowers "	£28	..
a " Lump "	£20	..
a Soda, Chlorate per lb.	8d.	..
a " Crystals per ton	£70/-	..
a Sodium Bichromate, casks per lb.	..	..
METALS, &c.		
c Brass (rolled metal 2' to 12' basis) per lb.	1/1¾d.	¼d. dec.
c " Tubes (solid drawn) "	1/4½ to 1/5	¼d. dec.
c " Wire, basis "	1/1½	¼d. dec.
c Copper Tubes (solid drawn) "	1/6½	¼d. dec.
g " Bars (best selected) per ton	£148	..
g " Sheet "	£148	..
g " Rod "	£148	..
d " (Electrolytic) Bars "	£118	£7 dec.
d " " Sheets "	£154	£7 dec.
d " " Wire Rods "	£196	£7 dec.
d " " H.C. Wire per lb.	1/4½	..
f Ebonite Rod	3/-	..
" Sheet	2/6	..
n German Silver Wire	2/6	..
h Gutta-percha, fine	10/- to 11/-	..
h India-rubber, Para, fine	2/5½	¼d. dec.
i Iron Pig (Cleveland warrants) per ton	Nom.	..
i " Wire, galv. No. 8, P.O. qual. "	£42	..
g Lead, English Pig per ton	£26	30/- inc.
g Mercury per bot.	£23 10 to £24	..
e Mica (in original cases) small per lb.	9d. to 4/6	..
e " " " medium "	5/- to 10/-	..
e " " " large "	12/6 to 25/- & up.	..
d Silicium Bronze Wire per lb.	1/7½	..
r Steel, Magnet, in bars per ton	..	..
g Tin, Block (English) "	£263 to £264	£2 dec.
n " Wire, Nos. 1 to 16 per lb.	4/-	..

Quotations supplied by—

a G. Boor & Co.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
r W. F. Dennis & Co.

Aeroplane Wireless Control.—The possibilities of wireless control of aeroplanes, which will render it no longer necessary for a pilot to accompany his 'plane, are recounted by M. Jean Parzis, who in the *World's Work*, says:—In the early days of 1918, thanks to the sympathetic assistance of M. d'Aubigny, President of the Interministerial Commission of Civil Aviation in Paris, some French officers secured authority and facilities from the French Ministry of War to carry out a series of trials with "Telemechanism" mounted upon some bombing machines placed at their disposal. Telemechanical control represents the operation of apparatus from a distance and at will. In the present instance the object to be attained involved replacing the pilot's manipulation of the controls of the aeroplane, as well as the command of the motor, by means of electro-magnets actuated by Hertzian waves transmitted from a point outside the aeroplane. In the first experiment a pilot stationed on the ground was able to induce the aeroplane to manœuvre at a distance of several kilometres. This end was achieved with a low-powered plant capable of being carried in a motor-car or even by an aeroplane. The receiving apparatus mounted in the aeroplane comprised the antennæ, together with amplifiers of variable frequency, as well as distributors of the usual type. During the month of September, 1918, an aeroplane equipped with an automatic stabiliser completed a circular flight of 100 kilometres (62½ miles) without being capsized by the wind or violent cross-currents of air.

"Beldalite" Moulded Insulation.—"Beldalite" was primarily designed for the production of high-tension distributors: its low coefficient of expansion, coupled with its stability towards fluids, has rendered some service towards solving various insulation difficulties met by a prominent motor manufacturer. Any type of insulated brush-holder stud can be produced by means of moulds, and it might prove of interest to motor manufacturers to investigate the merits of "Bedalite" as compared with other forms of insulation, whether built up or otherwise. Its average dielectric strength is 20,000 volts per millimetre, and its makers apply stringent tests to all pieces before dispatch. A further point of merit is the intimate contact "Beldalite" makes with metals when moulded. In some instances, an actual saving in production of the metal parts may be effected by the manufacturers, owing to the fact that the parts to be insulated are far better left in the rough.

THE ELECTRICAL CONTRACTOR IN SWITZERLAND.

By E. P. BENNETT.

The idea that electricity abounds throughout the whole of Switzerland in unlimited quantities, generated at very low cost by power derived from the many rivers and waterfalls, is probably held by a very large number of Electrical Review readers. In fact, we have often heard the remark that were we living in Switzerland we should all be confirmed and regular users of everything electrical—lighting, heating and cooking; homes, offices, workshops and factories would all be fully equipped with electrical appliances of necessity and luxury. Hotels, for certain, would be nothing less than electrical exhibitions from basement to top floor. To those who have not an intimate acquaintance with the facts, let me say that the actual position here is nowhere near the popular notion. We should, however, be correct in saying that the possibilities exist for this electrical Utopia. The rivers are ever flowing with a strong current, exerting unlimited power; the waterfalls are numerous; the country is adapted for short-distance transmission, and the people are progressive and ready to take advantage of their unique natural resources. But the restrictions now in force on the consumption of energy are many. Electric radiators, irons, and other appliances must be strictly limited to certain loadings; the lighting peak must be carefully watched; cooking ranges and other heavy-current consuming devices come under the ban of a special set of rules. In fact many of the hydro-electric stations are fully loaded and distributors worked to their utmost capacity. House wiring, to our solid way of thinking, is very primitive; internal cables are small, the protection afforded by the wiring system is inadequate, and the wiring is insecurely installed and finished off by runs of flexible cables in such lengths as would cause grave misgivings in the minds of our own supply companies and fire authorities.

These remarks are based upon personal observations in the larger cities and towns of the country, the only exception being, perhaps, in some of the mountain hotels, which are electrical exhibitions in miniature of real interest. It is only to be expected that plans are in operation or in the making to remove this limitation of energy supply, and I am certain that in the near future this country will be the show place for electrical operations.

To help this work forward an electrical exhibition, say, at Berne, of home and foreign manufactures of electrical appliances and machinery would prove a great success. The idea is one for international exhibition promoters, who would do better in this thriving industrial and progressive agricultural country full of wealthy and well-educated and friendly people—anxious to use the natural resources of their homeland—than in some of the more distant centres which seem so attractive. At the same time I would like a selection of our own contractors representing various parts of the country to go on a real business tour of inspection, visiting Geneva, Lausanne, Berne and Zurich with the set purpose of obtaining a few ideas as to the way in which the Swiss contractor's business is run and his establishments are equipped and managed. The back-street shop, with all its disadvantages and grime, does not exist; porous pots and coils of cable do not enter into the Swiss scheme of decoration, and I must confess that after some years' acquaintance with our own contractor's "shop" the local establishments came to me as a pleasant and interesting surprise. If there is a main street in a Swiss city of more than usual importance—there you find the electrical contractor. His establishment presents a good appearance, with a well-designed front and attractive name-plate, a clean window with oak panelled interior, dust-tight except where the window forms part of the design of the shop, through which you have a good view of a well-arranged showroom and reception room. Here you find panelled walls with selected fittings displayed—just a few, but in the right position and situated in correct surroundings. Polished air-tight show-cases fill certain recesses full of show pieces in good condition and finish. The polished floor space is large, and little polished island counters are spaced down the shop at intervals. Good and comfortable chairs are in abundance. The floor is usually of oak parquet, and the whole interior is finished to pre-arranged design; a few good floor standards are displayed, and on the ceiling slung from oak beams you find just enough good fittings, well balanced and all complete, ready to light up on demand. Smart oak containers are provided for "gift" catalogues. Pen, ink and writing pads are in evidence, and a telephone is provided for the use of clients. Everything is in place and scrupulously maintained on the floors above, where one finds a series of showrooms to inspect; in each room are selected appliances; nothing is crowded, and, above all, the inspecting clients' comforts are not ignored. The shop assistant is usually a well-dressed lady with ample knowledge of salesmanship and certainly of good deportment. For technical answers a man is within easy call, who can give all information required concerning matters other than sundry shop sales.

To meet the expenses of these establishments a good business is done in portable appliances, lamps, shades, and sundries.

The contractors "get together" in respect of selling, prices, their union covering boycotting methods for defaulting members, and, more important still, securing for the trade its legitimate interests. For instance, should a department store having no contracting branch offer certain electrical goods for sale, you may be certain those goods find no buyers in contracting circles; nor are they content to handle and fix goods so purchased. These methods seem to secure for the contractor the bulk of the sundries sales.

In some instances contractors have their establishments in the centre of residential districts; here they do not spoil the locality by opening a shop, but give an intimation of their profession by a neat brass plate. The interior of the house is then transformed to appropriate design, and appliance and fittings salons are opened. Visiting clients view all they wish to see from an easy chair or central lounges, and I must say that if the richness of the contents affords any criterion, a large and profitable business must be the result of their speculation and lavish expenditure on the premises devoted to creating interest in things electrical.

I rather envy the Swiss contractor his foresight and initiative in this direction, and only hope we may in good time copy from the best of his methods and bring up the standard of our contracting shops, shall I say, in keeping with the quality of our contractors' actual work of installation where, without doubt, we are a long way ahead of anything that can be found (generally speaking) in the country in which and of which I am writing.

NATIONALISATION OF GERMAN ELECTRICITY SUPPLY WORKS.

Proposed expenditure of £50,000,000 on Expropriation.

As was mentioned in our editorial columns last week, a Bill has been introduced in the German National Assembly for the socialisation of the supply works in that country, the development of high-pressure long-distance transmission lines, and the promotion of hydro-electric works. At present there are over 4,000 supply works distributed throughout the country. Although a plant capacity of 5,000 KW. is put as the minimum limit of a works which can be converted into national property, it is obvious from the text of the Bill that stations of lower powers can also be absorbed by the State. An abstract of the Bill is as follows:—

The "Empire" is empowered to take over in return for the payment of suitable compensation (1) the property in installations which are intended for the transmission of electrical power at a pressure of 50,000 volts and upwards: (2) the property in installations (electricity works) which have an installed machine capacity of 5,000 KW. and upwards, which are in the possession of private undertakers and do not serve for the production of energy for their own purposes; and (3) the rights held by private undertakings for the utilisation of water powers for the production of energy with a capacity of 5,000 KW. and over, inclusive of the property in the installations erected in the exercise of these rights. All the installations and equipments which form an economic unit with the power station belong to the electricity works in the sense of No. 2; and present owners can demand that there should be also taken over such installations and equipment as would become unutilisable by them on the transfer.

Installations of the kind mentioned under No. 2, which are owned by a joint stock or other company or corporation, are considered in the sense of private undertakings, also if Free States or unions of communal authorities are interested in them, either directly or through other companies or corporations. In such cases the interested Free States and communal unions can demand that the electricity works taken over by the Empire shall be transferred to a company in which they will be interested to an extent corresponding to their prevailing participation in the electricity works. These regulations also apply to the rights and installations in connection with the utilisation of water powers according to No. 3.

The rights and duties devolving upon present owners in relation to third parties, will pass over to the State on the taking over of the works and installations; rights of reversion, &c., are extinguished—working contracts and lease contracts terminate with the transfer of the works and rights to the State, and the latter has to pay suitable compensation to the lessees.

The compensation to be paid for the acquisition of the works consists in the cost of establishment having regard to suitable provision for depreciation. The compensation for taking over rights for the utilisation of water-power, consists in the recoupment of expenditure incurred by the interested parties in regard to the rights to be taken over; the compensation for the dissolution of a working or lease contract is the recoupment of the damage caused through the dissolution, but not for lost profits.

The Empire can demand that electricity works, also if they do not fall under No. 2, shall be transferred to companies in which the Empire is interested. The existing owners of the works to be incorporated are to participate in the company conformably to the value of the works; as an alternative, they can apply for compensation.

If a contract between the interested parties concerning the transfer and incorporation of installations and rights is concluded, the taking over proceeds on the basis of this agreement. If, however, an agreement is not reached, arbitration is to be resorted to so as to determine which installations and rights are to be acquired by the Empire or to be embodied in the company, and under what conditions; right of appeal against the decision of the Court of Arbitration as to the amount of compensation or participation is admissible to a High Court of Arbitration constituted in connection with the "Imperial" Financial Administration. The property in the installations and rights passes into the possession of the Empire or company on the award being announced to the interested parties and in accordance with the decision of the Court.

The Minister for the Treasury and the departments directed by him, are authorised to demand information at any time concerning all circumstances of a legal, technical, and economic kind, which appertain to the installations and rights. The obligation to impart information is placed upon owners and lessees and persons interested in or managing such installations or rights; and the information can be called for either by public announcement or by inquiry of the persons concerned. The Minister for the Treasury and his departments are empowered to inspect papers and books, in order to ascertain important data, together with works and other premises, concerning which information is required.

The Empire, on the ground of public welfare, can grant the right for the expropriation or limitation of ground property for an undertaking, in return for full compensation, which is intended for the production, transmission and distribution of electrical energy, and for the exercise of which the right of expropriation is required. Penalties, in the form of fines and imprisonment, are provided for in case of the intentional withholding of information. A credit of up to £50,000,000 is placed at the disposal of the Minister for the Treasury for carrying out the terms of the proposed law.

The publication of the text of the Bill has been almost immediately followed by complaints on behalf of the Free (Federal) States that the measure contains too much obscurity, and requires amendment. The States attach special value to the fixing of a tariff for the services to be rendered, a more detailed definition of the extent of the socialisation, and the transport of electricity to the places of consumption. It is contended that the Bill must be postponed until these points are cleared up, that the States should participate by means of a Council in the deliberations concerning the socialisation of various works, and that the expropriations should take place, not through the Empire, but by the States individually.

AN EXTERNAL PROGRESS DEPARTMENT.

By LESLIE G. TOPLIS.

The "transmission" of a manufactured product from the abstract in a designer's brain to the concrete in the user's possession, is a series of physical and psychological processes, each of which has from time to time been given serious attention by students of manufacturing organisation. Systematic production has been raised practically to the level of a science, treating all individual operations in relation to themselves and to each other, and ensuring that the passage of the product through "the works" is carried out with the maximum efficiency. Again, the organisation of salesmanship within recent years has brought this section of the "transmission" to a more efficient level, although the controlling factors, being more psychological than physical, it has not reached so effective a standard as that obtainable in dealing with production alone. It is not, however, the object of this article to deal with this section of the subject, but to confine attention to a still weaker link in the system—namely, the connection between production and the market, between the technical and the commercial, or, in other words, the works and the sales depôt.

Losses here are proportionately heavy; not that there is anything in the nature of a direct "resistance" existing; but that, in a greater or lesser degree a counter E.M.F. is set up, a purely pyschological condition, the result of differential outlook of the personal elements. To those at the works who daily hear and see nothing but of "the firm" and the article it manufactures, there comes in time, even though

there has been previous association with other concerns, a subconscious thought that the whole of the market is dependent upon them and their efforts. On the other hand, the salesman, struggling in the midst of a turbulent sea of commercialism, is so constantly reminded that his firm is but one of many, and, perhaps, an insignificant one at that, that he subconsciously feels that his own people are becoming out of date, losing ground, and, therefore, loses confidence in an undertaking he was once proud to represent.

It is with the idea of eliminating this atmosphere as much as it is possible that the writer suggests the introduction into manufacturing concerns of what may be called, for the want of a better term, an External Progress Department; a department that would act as a link between the works organisation on the one hand, and the sales organisation on the other, whilst maintaining, as far as possible, a detached attitude therefrom. Wherever there is an opposition of views in regard to a definite question, there are claims for and against by both parties; therefore, as a foundation for such a department, an absolute understanding of the position of the claimants is necessary. Such a department would act more in an advisory than a dictatorial capacity, and would present to both sides of the undertaking the opposition view in as clear a language as can be appreciated by them. At the same time both parties would present to the department their difficulties and "reasons why" in relation to all matters of manufacture and sale.

The above is but a general outline of what would constitute the foundations of this department, the essential feature being that whoever acts in the capacity shall be thoroughly conversant with the whole of the "transmission" outlined above.

Having established a thoroughly sympathetic relation between the two branches of the organisation, developments may be continued further.

Taking a concern manufacturing electrical switchgear as an example, it should be possible, from technical details supplied by the works, to have prepared in not too technical but thoroughly logical language, publications dealing with every individual manufacture produced. Catalogue specifications or "House Organs" rarely answer this purpose, their object being usually to give definite facts but not a "reason why." To illustrate this point more fully, it should not only be possible for a salesman to state, in dealing with a particular type of switch, that such and such a current per sq. in. of contact surface has been allowed for, but why, also what standard, and so forth, has been adopted as a basis. In short, it should be possible for the salesman, in a metaphorical sense, to pull the whole of the product to pieces for the inspection of the buyer, and present to him, in straightforward language, why the article he is submitting for sale is designed on the lines that it is.

It is in the disassembling of the article, in this sense, on presentation to a prospective buyer, that in numerous cases valuable criticism can be obtained. The buyer possibly finds that the article falls short in a detail necessary for a particular application, and mentions the failing; it should be noted and eventually find its way to the department for submission to the works. It is not suggested that any trifling variation should be immediately adopted, simply because the product fails to comply with a particular person's requirements; but all suggestions should be considered by those responsible for the design, so that the application may be widened to the utmost possible extent. The ultimate object of production, as regards electrical manufacture, is application, and this fact should never be lost sight of, for the greater the application consistent with economic production, the greater the utility and demand.

A further function that may be allotted to the department, is the study of design and development of competitor's goods.

There is a well-known adage laid down for salesmen—namely, "Know thy goods"; to this may well be added, "Know thy neighbours'." To those actually engaged in manufacture and sales operations there is little time or opportunity available to investigate other manufactures than those of the firm represented. At the same time, to have at hand logical reasons why, when submitting an article to a buyer, it differs from, or is superior to so and so's, is to be possessed of a weapon which, if handled correctly, gives considerable advantage to the seller. Again, any particular improvement in a competitor's product, which may endanger the status of an existing product made by the firm, would be investigated by the department and handed on to the designs department for consideration. After investigation, the sales depôt would be advised as to how this new form of attack could best be encountered.

DEVELOPMENT AND STORAGE OF WATER FOR ELECTRICAL PURPOSES.

By J. W. MEARES, M.I.E.E.

(Abstract of Paper read before the I.E.E.)

The general principles underlying hydro-electric developments are very little understood outside the ranks of those directly interested. In this paper the subject is examined purely from the point of view of delivering, and continuing to deliver, water to a prime mover. The problems of low, medium, and high heads differ considerably, and each may be dealt with in various ways. There is no exact line of demarcation between the three stages, but, generally speaking, low heads involve the use of pressure or reaction turbines, often submerged, with suction or draught tubes connecting the outlet with the tail race, from about 3 ft. as a practical limit up to 80 or 100 ft. High heads are dealt with by the jet impulse type of wheel exemplified by the Pelton wheel, from a possible 5,000 ft. or so down to 300 or 400 ft. Between these two extremes lie the medium falls, using impulse turbines of various types according to the head. In America this type of wheel is little used and jet impulse wheels are mostly used.

At the most economical load the efficiency of various types of hydraulic turbine or wheel varies from 85 to 90 per cent. in large sizes, while the corresponding overall efficiency of alternators, including excitation losses, will be from 95 to 97 per cent. Thus the overall efficiency under the most favourable conditions will vary from 81 to 87 per cent. For practical industrial purposes it will be sufficient to assume the overall commercial efficiency, E, of the plant M to be:—

For	500	KW.	74 per cent.
,,	1,000	,, ...	76 ,,
,,	1,500	,, ...	78 ,,
,,	2,000	,, ...	80 ,,
,,	3,000	,, and over	82 ,,

Using the "cusec" for a flow of a cubic foot of water per second (termed a foot-second in America), we then have:

E.H.P. output = (cusecs × 62·4 × gross head in feet)/550 × E/100.

It is convenient to use a direct conversion factor and to avoid decimals of no real significance, as follows:—

For	500	KW.		=	cusecs ×	gross head ×	0.062
,,	1,000	,,		=	,,	,, ,,	× 0.064
,,	1,500	,,		=	,,	,, ,,	× 0.066
,,	2,000	,,		=	,,	,, ,,	× 0.068
,,	3,000	,,	or over	=	,,	,, ,,	× 0.070

For rough purposes it is quite sufficient to take kilowatts = cusecs × feet/15, or B.H.P. of turbine = cusecs × feet/11 for mechanical power as reliable mean figures, except for small installations where the divisor will be higher. Even in the most favourable circumstances the water flowing through the turbines is only a very variable proportion of that which is precipitated on the catchment area. It is therefore necessary to refer generally to other factors which affect the problem, especially where storage is an essential part of a project.

Formulæ for calculating the maximum run-off from a catchment have been devised by many engineers, but they all employ coefficients which it is impossible to ascertain without a comprehensive study of the nature of the area and the rainfall. It may, however, be accepted that a study of the daily rainfall observations over a period of 30 years will give a fairly accurate idea of the conditons which are likely to occur in future, and if different percentages of run-off are assumed for light, medium, and heavy falls, depending on the nature of the catchment, a fairly accurate forecast can be made. As a practical example of the method, the following empirical

table has been tentatively adopted in the United Provinces (India).

Light falls under 0.5 in. in 24 hours should be entirely omitted unless continuous for several days; falls from 0.5 to 1 in. in 24 hours should be omitted if there has been no fall before or after. Falls from 1 to 1.5 in., when not followed or preceded by similar or greater amounts, are considered to be light.

Medium falls are those from 1 to 1.5 in. when followed or preceded by any but light falls; also all falls from 1.5 to 3 in.

Heavy falls are those over 3 in., or continuous falls over 2 in. a day; also all falls of an intensity of 2 in. an hour or over.

Percentage Run-off Assumed.

	A	B	C	D	E
	p.c.	p.c.	p.c.	p.c.	p.c.
Light falls	1	3	5	10	15
Medium falls	10	15	20	25	33
Heavy falls	20	33	40	55	70

A=flat, cultivated and black cotton soil catchment.
B=flat, partly cultivated and stiff soils.
C=average catchment.
D=hills and plains with little cultivation.
E=very hilly, steep and rocky with very little cultivation.

The question of evaporation arises wherever long canals or large storage reservoirs are employed. The actual amount of evaporation varies so greatly that no general figure would be of the slightest value. Percolation and absorption also account for no small amount of the water, but the loss must be determined in each case as it arises. The following figures are worth remembering in projects involving storage: 31½ million cu. ft. of water will give 1 cusec throughout a year; or, taking losses into consideration, about 35 million cu. ft. A square mile submerged to 1 ft. gives about 27¾ million cu. ft., and an acre-foot about 43,000 cu. ft.

The ideal site for a reservoir is where a stream with a good catchment area runs through a fan-shaped valley with flat longitudinal and transverse sections. Trial pits alone are not sufficient evidence to found a dam upon; the whole alignment should be trenched. Where the catchment is large, the valley cultivated, and the flood water escaped over the dam itself, it is generally more economical to build the dam where the best rock for the foundations is found, rather than at the narrowest point of the valley.

The economic height of the dam and the line to which storage water is to be collected depend upon: (*a*) Requirements for power or irrigation, or both. (*b*) Catchment area available for storage: it is frequently possible either to add extra catchment areas at a small cost, where water is deficient, or to divert a portion of the area to another drainage when it is in excess of the requirements and there are difficulties about the escape. (*c*) Rainfall on and the actual run-off from the catchment. (*d*) Nature of the submerged area, where extra height may involve on the one hand the submergence of valuable property or, on the other hand, an extra 50 to 100 per cent. of storage capacity. (*e*) Nature of the seasons; in some places the run-off may vary from zero to nearly 100 per cent. of the rainfall.

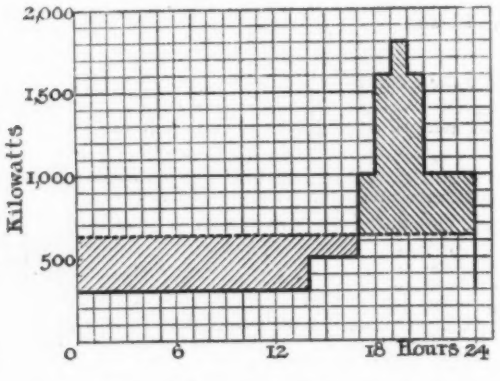

Fig. 1.—Typical Load Curve.

It is sufficient to assume here an overall efficiency in the plant of 76 per cent., giving straight-line "curves." With this efficiency 1,000 kw. requires a flow of 15.54 cusecs under 1,000 ft. head, or 15,540 cusec-feet under any other head. With the assumed head of 1,000 ft. this flow of 15½ cusecs represents (in round figures and exclusive of evaporation and percolation) 1½ million cu. ft. a day, 41 million cu. ft. a month, 490 million cu. ft. a year, to maintain 1,000 kw. continuously in each case. For any other head the storage will vary in inverse proportion, while for any other value in kilowatts of continuous output it will vary in direct proportion. Now 1 kw. for a year represents 8,760 b.o.t. units, so the above 1,000 kw.-years give 8¾ million units on the assumption of 100 per cent. load factor. The amount of storage is therefore directly proportional to the units generated, whatever the load factor may be; for if the load factor is 50 per cent. it follows that 2,000 kw. of plant can actually be maintained by the above quantities on the assumed head, while the output in units will be unaltered.

The function of water storage is, on the one hand, increase of power throughout the year or the dry season; on the other hand, regulation day by day. The latter may in favourable conditions also enable the size of the plant to be substantially increased. The incidence of the rainfall, the rate of evaporation, the natural possibilities of the ground, and the load factor of the plant all enter the argument. The amount of storage that will serve to give (say) 1,000 kw. for a year on 1,800 ft. head would give the same for a month on 150 ft. and for a day only on 5 ft. Within ordinary limits of capital cost a project depending entirely on monsoon storage, with no appreciable inflow during the greater part of the year, is impracticable except on high heads. Where a moderate flow of water is normally available under a high head, storage on a large scale may be used to supplement the flow at seasons of low water, provided that the excess flow in flood times can be depended upon to fill the reservoir. Thus a flow of 15 cusecs under 2,000 ft. head will give 2,000 kw. continuously, or considerably more on ordinary load factors. If this flow is the minimum, much water will be running to waste at other times, in the absence of storage. Assume the average flow throughout the year to be 45 cusecs, then the excess 30 cusecs can be stored. It would amount to 950 million cu. ft. in the year, but, as there would be a draw off whenever the

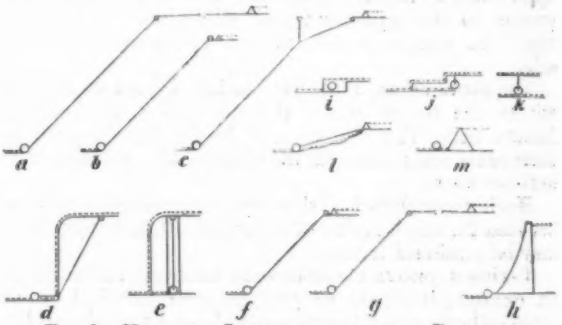

Fig. 2.—Hydraulic Lay-outs met with in Practice.

flow diminished, only a proportion of this storage capacity would be actually required. It would suffice to give a further 4,000 kw. continuously, so the whole plant, assuming a 50 per cent. load factor, could be 12,000 kw.

Where a moderate minimum flow is combined with a medium head, storage on the same large scale can be utilised to impound the excess flow within limits. If the minimum flow is equivalent to 2,000 kw., say 100 cusecs on 300 ft. head, and the average flow is 200 cusecs, the whole of this excess could not be stored without undue expense; but a resrvoir of practicable size would enable larger plant than 2,000 kw. to be installed. Where rainfall is fairly regular, except for a few dry months, storage would act as a reserve to tide over the dry period with larger plant than the minimum flow could deal with. Assume 1,000 million cu. ft. of storage. Then, on 300 ft. head, this is equivalent to 5½ million kw.-hours. In the first instance this would mean an extra 800 kw. working continuously for nine months; in the third case it would keep 2,400 kw. at work for the three dry months; subject in both cases to the load factor, which would allow more plant actually to be installed. It generally comes about that on medium heads storage can only be utilised as reserve against drought, or against breakdown in the water channel where one is necessary, and not for increasing the plant capacity greatly above that maintained by the normal flow. For regulating purposes, however, it can be exceedingly useful, especially where the load factor is bad. Thus, in the case of a small plant, if the daily maximum load over the lighting peak is three or four times the average load, and the normal minimum flow can be depended upon at the forebay, very little storage will be of value. A minimum dry-season flow of 20 cusecs and a head of 500 ft., equivalent to 630 kw. generated, is capable of generating 15,000 units per diem, if it can be utilised. The load curve (fig. 1), squared for convenience, shows a peak load of 1,800 kw. for an hour, and the load factor (*i.e.*, ratio of the area of the curve to its enclosing rectangle) is 34 per cent., so that 14,700 units are generated altogether. The dotted line shows the power which the flow can generate, while the shaded areas represent the periods when excess water is being stored and drawn on respectively. Between midnight and 17 hours, 5,700 units are actually generated, while the flow is capable of giving 630 × 17 or 10,700 units. Therefore 5,000/10,700 of 20 cusecs or 9.35 cusecs can be stored. This in 17 hours amounts to 570,000 cu. ft., which will more than supply the extra 4,600 units between 17 hours and midnight. Many a small proposition has been turned down for lack of understanding this valuable application of storage. Generally large scale storage is impracticable on low-head plant, *i.e.*; although there may be a considerable reserve behind a dam, either

feeding directly into the turbines or further up-stream, it is generally no more than suffices for regulation. The enormous volume of water required to maintain a large unit of plant for even a month would render such a proposition commercially impossible.

Hydro-electric plant must be placed where the ground admits, and designed to suit it. Thus it may happen that a high fall cannot be developed conveniently as a single station, but can be utilised in the form of two stations in series. Fig. 2 shows the varieties of hydraulic lay-out met with in practice. In high-head schemes, in order to get the most suitable fall with as short a length of pressure pipe as possible, it is almost always necessary to carry the water for a considerable distance in an open channed (fig. 2, *a*) which offers a weak link in the chain, and duplication is impossible, though occasionally two or more separate sources of supply may be tapped by different routes.

To allow for fluctuations of load a forebay at the head of the pressure pipes is essential, unless water is so plentiful that an excess is always running to waste at this point. Thus if the channel can deal with a steady load of 2,000 KW., and the peak load averages 2,500 KW. for two hours, there must be at least 1,000 KW.-hr. stored in the forebay. On 1,000 ft. head this amounts to about 56,000 cu. ft., which is of no practical use as a reserve against a temporary breakdown in the channel or at the headworks, and wherever possible a scheme of this nature should have enough storage at the pipe head to tide over at least a few hours' stoppage from such causes. In some cases of steep ground it is possible to locate the power house so near to the headworks, even with high heads, that the water can be carried in pipes the whole way, without an open channel (fig. 2 *b*). Here the risk of breakdown is a minimum. An intermediate case between these two extremes is where the distance from reservoir or headworks to power house is considerable, but a channel cannot be constructed owing to the slope of the ground. In America the usual method of dealing with such problems is to use wood stave pipes for the upper part of the pipe line, with a surge tank at the junction of these with the steel pressure pipes, where the steep fall begins (fig. 2 *c*). The surge tank consists of a reservoir, elevated to the level of the water where it enters the stave pipes, connected to the junction. With medium heads where many rapids occur in a short length of bed it may be possible to pipe the water direct from the stream to the power house (fig. 2 *d*), with a forebay interposed to prevent detritus getting into the pipes. In several American schemes either the whole power house is located at the bottom of a shaft cut down vertically in the rock behind the fall (fig. 2 *e*), or the turbines are placed in such a shaft and operate generators on the surface. Sometimes the pressure pipes can be led directly into the reservoir (fig. 2 *f*) or into a forebay constructed immediately above the fall; a short canal at most is required, and as it must be of large carrying capacity there is a great saving in such a natural fall.

Where the river has a considerable bed slope, or rapids, it may be necessary to carry the water for miles in a canal (fig. 2 *g*). Occasionally a medium-head plant may be worked directly from a reservoir behind a high dam (fig. 2 *h*), but in such cases there will obviously be very large variations of head to contend with, sometimes from full head to none at all; generally such a reservoir will have been built primarily for irrigation purposes, so that beyond a certain minimum the flow is strictly regulated according to season. This detracts from the commercial value of any such scheme.

In the case of irrigation canals, falls of from 3 to 10 ft. are not uncommon, and can be developed by taking a feeder channel as a by-pass to the power house, continuing as the tail race back to the canal below the fall (fig. 2 *i*). Sometimes a subsidiary canal (generally in the form of a tail race) will enable two neighbouring falls to be combined so far as the turbines are concerned (fig. 2 *j*). Larger heads, but still of the low type, may occasionally be developed, where irrigation requirements permit, by discharging part of a high-level canal through turbines to a low-level canal (fig. 2 *k*). In the case of rivers, low falls may be developed on the lines already described for medium falls (usually as fig. 2 *l*)—always bearing in mind the ever-increasing size of channels and pipes as the fall decreases. In addition there are various schemes in which a dam is placed across a river not to store water but to obtain head. Here the water is fed directly from the dam to the turbines (fig. 2 *m*), which in some cases are placed inside a hollow dam. Great variations in the level of the head and tail waters are often a feature of low-head river developments, and floods are a serious menace. In some cases double turbines are installed, one for the maximum head and the second for the reduced fall. Flood gates, as used in irrigation canal headworks, are required to deal with abnormal rises.

The liability of bringing down mud and debris from the source of supply to the turbine wheels increases with the head, as torrents take the place of larger rivers, and its effect on the wheel buckets also increases with the head and the spouting velocity of the jet or nozzle. Even the finest grit under a head of 1,500 or 2,000 ft. is most destructive. Coarse and fine strainers should be provided in forebay reservoirs, and they should be of such breadth that the full flow required by the wheels can pass through them if the water accidentally falls low. This is often overlooked. The forebay should be sectionalised or duplicated to admit of cleaning out. Small points of design may spell the difference between success and partial failure, though much depends on whether clear or dirty water is generally brought in. High heads need the most careful treatment; medium heads may or may not need complicated forebays, and with low heads a plain tank is generally sufficient. Apart from the question of cost there can be no doubt that the ideal arrangement of pressure pipes is self-contained units of pipe, turbine, generator and step-up transformer, just as in modern steam practice. Where very large units are involved no other arrangement is likely to be used, and on low heads no other arrangement is generally possible. The diameter of a short pipe on a moderate head may be such as to give a velocity as high as $0.1\sqrt{(2gH)}$ or 10 per cent. of the spouting velocity. The loss of head with such velocities would soon become too great, and about 3 to 4 ft. per second is a good average. On high heads 9 to 12 ft. per second in the smallest sections is about the limit used. In a good many instances pipe lines have been brought straight to the power house, and the turbine and generator mounted over the tail race in the same alignment, as in fig. 3, but the arrangement in fig. 4 is preferable.

With very high heads comparatively small pipes of great strength are required. Carriage to site is an expensive matter, it therefore pays as a rule to keep down the weight of individual loads, and to use a single pipe for each turbine. It is, however, often advisable to interconnect the various pipes at the forebay. Each pipe should be capable of being instantly closed at the forebay in the event of a bad blow-out, either by an automatic valve or by electrical control from the power house. Each pipe must also have an isolating valve at the forebay or a gate in the forebay. Air pipes and filling valves may also be required. A single pipe to serve two or more units by means of a receiver at the power house is not ordinarily recommended. Where individual pipes serve each wheel it is advisable to interconnect them at the power house, so that generating units can be cross served. This involves extra expense in isolating valves, but is generally worth it. It is not an identical proposition with the receiver.

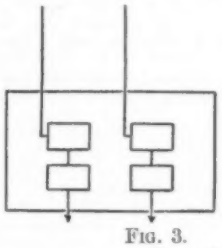

Fig. 3.

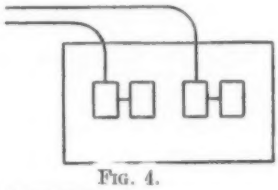

Fig. 4.

Pipe Line Arrangement.

There are no special points in which the pipe system on medium heads differs from that already dealt with. The pipes are of larger size, and their carriage becomes more serious unless they are built up on site, but on the other hand the locality is generally more accessible. Air valves and cushions are seldom required. With very low heads and submerged turbines the draught tube is the only pipe required, while with somewhat higher heads there will be both pressure pipe and draught tube. With large units of plant the size of the pipes becomes very great and the internal hydraulic pressure becomes a secondary consideration. Cases are on record where an automatic gate, serving a very large pipe, was closed at the forebay and air pressure caused a complete collapse. No interconection is usually practicable or necessary with low heads.

On low-head plants the essentials of the tail race are that it shall be of ample size to give a very low velocity of discharge, and that it shall be free from eddies. With medium and high heads the tail-race pit must ensure that there are no waves tending to stop the free exit of the water, and it must also cushion the discharge. On heads of 2,000 ft. or so the destructive effect of the spent jet is surprising, and masonry is quite unable to withstand it. With regard to cost, from the generator onwards there is no great difference in capital cost between steam and hydro-electric stations, and the cost of the power-house buildings will be comparable. The boilers, steam pipes, engines or steam turbines, condensing plant and accessories are replaced by the comparatively simple turbine wheels and their supply pipes in the most favourable cases; but in less simple plant there is also the whole cost of the hydraulic development, channels, forebays, reservoirs and dams to set off against the steam plant. The working expenses—staff, management, lubricants and stores, maintenance and repairs—do not differ in principle in the two instances; practically the annual cost of fuel in the one case must be set off against the extra annual capital charges in the other. An important difference between steam and hydraulic working lies in the fact that every unit generated by the former method costs a definite sum in cash for fuel, so that actual loss would result in selling at that figure; whereas with water power there is no such cash expenditure and any sales which will fill up hollows in the load curve without affecting the peak must be profitable at whatever rate they bring in. The common idea that water power costs nothing is true only in this limited instance. In any such comparison capital cost, cost of fuel, and load factor are the three essentials which determine whether a project can best be served by fuel or by water power.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

Presidential Address to Irish Territorial Centre.

Mr. C. H. Wordingham, C.B.E., President, delivered his address to the Irish Centre at Dublin, on May 19th, and at Belfast on May 20th last. The following is an abstract of the address, which consisted mainly of a paraphrase of the Electricity (Supply) Bill.*

The Dublin Local Section, or as it is now called the Irish Territorial Centre, was founded in December, 1899, and it was one of the four first to be formed. A request was recently received by the Council to establish another Centre in Belfast, and I therefore visit Ireland to ascertain the feeling of members on the spot. The most suitable course would be to form a Sub-Centre in Belfast now, altering it to a main Centre if and when the numbers belonging to it justify such a course.

The electrical industry is to-day at the parting of the ways. It has often been stated in the past that the industry is in its infancy, but all must admit that it is now adolescent, and, like the common run of adolescents, it is contemplating matrimony, that is to say, marriage with the State. Like all marriages this is a leap in the dark, and no one can say with confidence how the match will turn out. In any case the freedom of private enterprise will to some extent, at all events, be exchanged for marital control. No more flights into the realms of fancy are to be allowed it; uniformity is to be attained everywhere, and every advance must be an advance as a whole; consequently such advance must be slow, and cannot be lightly undertaken. I am among those who, notwithstanding the possibilities of danger, hope for the best. It is unquestionably a great gain for Parliament to have awakened to the supreme importance of a cheap supply of electrical energy, and one must be gratified to know that the recently produced Electricity (Supply) Bill has been framed largely on the lines of a report presented to the Board of Trade by a thoroughly competitive and representative committee which obtained evidence from all quarters likely to be well informed on the subject.

One of the main features of the new Bill is the setting up by the Electricity Commissioners of District Electricity Boards. If a station is so small or so situated or equipped that it could not be conveniently used by the Board, the Board may be exempted from any obligation to purchase it. It is not quite clear what will then happen to the unfortunate little station which is unwanted, except that an opportunity will be given for a respectful hearing of its despairing wail.

The way in which the price of a generating station or main transmission line is to be arrived at is carefully set out in the Bill, and is free from a defect in the original report of the committee to the Board of Trade, inasmuch as it does not place at a disadvantage those undertakings which have made proper provision for depreciation as compared with those that have not. The Board has to undertake to supply the dispossessed authority with energy in quantities not less abundant and at prices not less favourable than would have obtained had it continued in possession of its property, and (this is very important) carried out improvements which it was at the time contemplating. This proviso is very fair, but one can see possibilities of a good many tussles in connection with it.

District Boards will be invested with very wide powers, and, where established, the whole of the electricity supply in the future will be in their hands.

An important point is the compensation for those officers or servants of the transferred undertakings who have suffered loss of employment or diminution of salary or wages by the transference. The payment of such compensation is not permissive, but is mandatory, and this is a most important improvement on the recommendations of the report on which the Bill is founded.

The second portion of the Bill deals with what are called transitory provisions, and some of these are very important.

Important powers in regard to wayleaves are given to the District Boards and to authorised undertakers, and the Boards are invested with the power to let on hire electric lines, fittings, apparatus, and appliances for lighting, heating, and motive power, and all other purposes for which electricity can or may be used. This is a most important right, the absence of which has pressed very hardly on local authorities.

The prices to be charged by the District Boards are to be subject to the approval of the Electricity Commissioners, and they are to be so fixed that the undertaking is not conducted at a loss. I may here call attention to a fallacy underlying this and an earlier portion of the Bill, viz., the assumption that in order to make a profit one has only to raise the price to the consumer. All experience goes to show that this is far from being true, on the contrary, most often the lowering of the price brings about the desired effect.

A word of warning, addressed rather to the public at large than to technical engineers, may be uttered against the extravagant hopes as to the extent of the reduction in price to the consumer that may be anticipated. It must not be forgotten that the saving expected is to be made on generation only, and that the distribution charges will remain practically unaltered; hence the percentage saving made is effected on a fraction, and not on the whole cost, and the price to the consumer will therefore be much higher than that commonly spoken of in connection with the cost of generation. A notable feature of the future, however, will probably be a great reduction in the discrepancy between the prices charged in different, and often adjacent, districts.

The Boards are given powers to borrow money for work the cost of which ought, in the opinion of the Commissioners, to be spread over a term of years including—and this is a most important provision—the payment of interest on money borrowed for capital expenditure whilst the expenditure remains unremunerative.

A radical change is about to be made in the conditions governing electric supply in Great Britain. The concentration of the legislative control in the hands of a single body the members of which will presumably be chiefly technical experts highly skilled in the problems with which they have to deal is a gain, the importance of which it is impossible to overestimate. The powers conferred upon these Commissioners are such as will enable them to control the design of the generating stations and transmission and distribution systems which are to be built in future, and gradually to eliminate those which do not conform with the general scheme. The day of the small and inefficient undertaking is about to pass, and we may look forward to electrical generation on the grand scale, with stations on sites enabling generation to be carried out on the most economical lines. The main danger to be guarded against is a tendency to carry uniformity of system too far, or to ride to death the idea of very large stations, or, as they have been not too happily named, "super-stations." There are still areas in which it may pay better to put down a small isolated station on a site not ideal rather than to insist upon the supply being taken from an economical generating station unduly far off. If the right men are chosen, however, they will realise this, and will not be unduly autocratic nor too closely wedded to preconceived ideas.

The powers given to the Commissioners for the carrying out of investigations with a view to improvement in practice are also of great value. It is true that the colossal scale on which any alteration in practice that may be determined on will have to be made will tend to deter the Commissioners from launching out into other than well tried improvements, and this may mean a certain amount of backwardness as compared with experiments made by individual enterprise, but it is to be hoped that means of avoiding this danger may be found.

The vesting of the carrying out of the supply in the hands of a district board is an experiment which may well give rise to a good deal of speculation as to the results. The district board would probably function very much in the same way as a municipal committee, but it would probably be larger than an ordinary electricity committee of a Corporation, and the introduction of large consumers and of labour may tend to weight being given to considerations which are very far removed from those making for the technical and commercial success of the undertaking. Like all constitutions the success or failure of the scheme must depend ultimately upon the individuals in whom the administration is vested, and one can only hope that the organisation proposed will be for the good of the industry.

The Bill, whatever its defects, if defects there be, is clearly an honest attempt to improve materially the position of the electric supply industry in this country; it has been framed on advice given after the fullest consultation with members of the industry itself, and its actual drafting has been with the aid of the highest technical advice obtainable. More than this we cannot ask, and it rests with every member of the industry to do his utmost to make the scheme work and the industry thrive.

There can be little doubt that with the abundant supply of energy which should shortly be available, the applications of electricity to industrial purposes and everyday domestic life will be largely augmented, and a great stimulus should be given to electrical manufactures of all kinds.

An important feature of the developments contemplated is the utilisation of sources of energy now running to waste, and the pressing into service of all available energy. Attention has been directed chiefly to the utilisation of blast furnace gas, and this will no doubt be one of the principal sources of waste energy, but we must not overlook the water power which now runs to waste, and which, though not concentrated in any great quantity at any one place, is in the aggregate of considerable magnitude. Already a scheme has been prepared for utilising the power inherent in the water which falls on Dartmoor, and there should be great opportunities for development in this direction in Ireland. The water power problem is greatly facilitated when worked in conjunction with large steam driven stations, and all sources feed into a common supply system. In Ireland there are

* Elec. Rev., May 16th, 1919, p. 559.

also great possibilities in the direction of the utilisation of peat for fuel.

In the great development to which we are looking forward we may well ask what part is the Institution of Electrical Engineers going to play. Already it has done a large amount of useful work for the industry, and it is unquestionably a living force. If, however, it is to effect anything like the amount of good of which it is capable it is essential that it should be given wider and more effectual powers. Of late, however, the Institution has taken a larger hand in industrial matters, and while not actually entering the commercial field it has afforded facilities to organisations whose objects are chiefly commercial for meeting under its auspices jointly with its own representatives, and in some cases it has been instrumental in the formation of new associations having commercial objects and the protection of the material interests of those constituting its membership.

In my judgment it is absolutely essential if the electrical industry is to rise to the heights of which it is capable that there should be one and only one representative body able to speak in the name of the entire industry. Such a body could readily be formed by the expansion and development of the Institution as we now know it. I have recently described in outline a scheme in accordance with which these objects could, I think, conveniently and practicably be effected. I hope that all members of the Institution will do me the honour of reading that address,* and that the Irish section will give an opportunity to its members of discussing the proposals which I have outlined.

I have only been able in the time at my disposal to give an extremely brief sketch of the future, whether in regard to the prospects of the industry or of the part to be played by the Institution, but I hope I have shown that great developments may be confidently anticipated, and that the community at large has much to hope for and to gain by the prosperity of the electrical industry.

AN ELECTRICALLY-DRIVEN TUBE MILL.

Several points of interest arise in connection with an installation of electrical plant, recently carried out by the General Electric Co., Ltd., at the tube works of the Talbot Stead Tube Co., of Birchills, near Walsall. The principal feature is the direct driving of two Pilger mills by a motor running at the speed of the mill, and driving without a flywheel. This is the first time that electric motors have been so used in Great Britain for Pilger mill driving; in fact, it is believed to be the first time that a Pilger mill has been electrically driven at all. In a Pilger mill there is a severe shock once every revolution, extending over about one-third of a revolution, when the rolls grip the tube. Accordingly, special attention had to be paid to the design of the motors. "Witton" d.c. machines were adopted, the voltage on which they run being 440. The normal full load of each is 188 h.p. at a speed of from 100 to 200 r.p.m. The speed drop between no load and full load is guaranteed to be not more than 10 per cent. at 100 r.p.m. and not more than 20 per cent. at 200

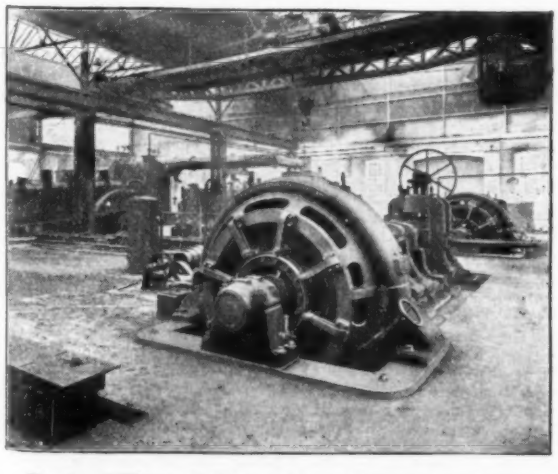

Fig. 1.—"Witton" 188-h.p. Motor Driving the Pilger Mill.

r.p.m. Further, the motor is able to stand up to a peak load of 400 h.p. for one minute at any speed within its working range. In addition to being fitted with interpoles, complete compensation is provided so that full output can be obtained at the most suitable speed for the size of tube in the mill. The shunt regulator for controlling the speed is placed near the motors in a locked case, to which the charge hand alone has access.

* Elec. Rev., May 30th, 1919, p. 623.

The special features which had to be introduced into the design in order to enable the motor satisfactorily to withstand the heavy shocks thrown upon it due to the absence of a flywheel include the provision of a very heavy shaft and low centre bearings, to enable them to withstand the "shock." The beds are also sunk in the ground, and the spider carrying the commutator is carried on an extension of the armature spider, to which it is fastened with two heavy keys. One of the motors is seen in fig. 1.

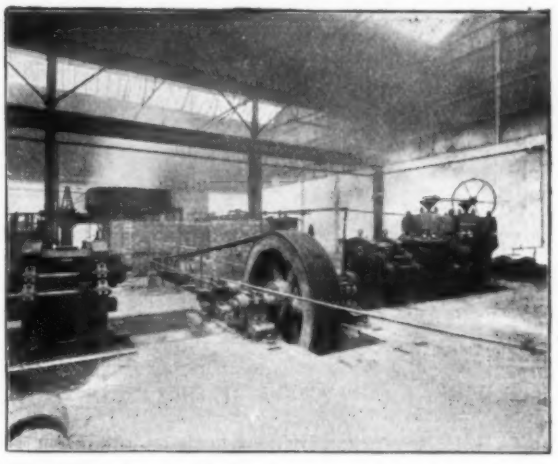

Fig. 2.—"Witton" 300-h.p. Motor and Rope Drive for the Finishing Mill.

Before the billets reach the Pilger mill they are passed through a piercer driven by a 300-h.p. three-phase "Witton" induction motor of the three-bearing type, driving the piercer flywheel through a rope drive. A duplicate motor with a similar drive is used for the rolling mill, which finishes the tubes to gauge. This is illustrated in fig. 2. With both these motors it was considered desirable to allow for a certain amount of slip, and an automatic slip regulator of the eddy-current control type was installed. This automatic regulator is also used for starting.

Power is obtained in the first instance from the three-phase 6,600-volt 50-cycle mains of the Walsall Corporation. This is transformed down, and, where possible, transmitted to various constant-speed motors, but for the Pilger mills a d.c. supply is required. To obtain this a 500-kw. rotary converter has been installed. This is a six-phase interpole machine of the standard "Witton" self-synchronising type.

The starting of the motors is in the hands of the operator in the rotary sub-station, which is situated at a considerable distance from the mill. Should the circuit breaker open due to an overload, a bell is rung in the sub-station and the attendant immediately closes the breaker. However, if the stoppage is intentional and for safety, there is push-button apparatus in various parts of the shop; a red light is shown on the switchboard, and the attendant is thus informed that he should not close the breaker until he receives the necessary instructions. Electric motors are extensively used at these works for driving hot saws, compressors and other auxiliary machinery.

The Channel Tunnel.—The Committee appointed by the French Minister of Public Works to study all questions relating to the Channel Tunnel, has finished its examination. Findings favouring the executing of the project have been adopted by the Council of Public Works and by the French Military Delegation. The Ministry of Public Works has authorised the formation of a French underground railway company to undertake experiments for new technical methods of tunnelling. The Committee asks M. Pichon to suggest to the British Government the formation of a Franco-British Committee to draw up the necessary agreement for regulations connected with the tunnel. It also asks that the British Government should obtain ratification of the agreement by the House of Commons.

Low-Temperature Carbonisation.—One of the chief drawbacks to the carbonisation of coal at low temperatures is the production of a semi-coke that is not hard and dense enough to stand transportation without disintegration. In a letter to *The Times* of July 29th, Lieut.-Col. Herman Clarke, C.B.E., R.E., describes the Summers patent process, which has been in successful operation in America for the past five years. In this system continuous operation is effected by aid of a reciprocating floor to the horizontal over, which by its motion longitudinally discharges the coke at one end and draws coal from the bunker at the other; at the same time, the plastic coal in the oven is heavily compressed by the movement of the floor, and the solid product is a hard dense smokeless fuel, while a high yield of by-products is recovered. The process is rapid and economical, and will shortly be demonstrated in this country.

NEW PATENTS APPLIED FOR, 1919.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs Sefton-Jones, O'Dell and Stephens (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

18,634. "Thermionic valves." L. A. McDougald. July 28th.

18,663. "Alternating current motors and rectifiers." L. B. Miller. July 28th.

18,665. "Means for adjusting timing of magnetos." A. H. H. Davies and H. R. H. Davies. July 28th.

18,678. "Electric lighting of machines driven by electric motors." V. Hope. July 28th.

18,683. "Thermostatic valve units." British Thomson-Houston Co. (General Electric Co.) July 28th.

18,734. "High-tension apparatus for hot cathode X-ray tubes, &c." A. C. Gunstone. July 29th.

18,766. "Electrically heated hot plates." F. P. Fletcher. July 29th.

18,787. "Double pole switches and fuse boards." G. H. Godbehere. July 29th.

18,797-8. "Cooling electric machinery transformers, &c." H. A. Camey and H. M. Lacey. July 29th.

18,801. "Means for making temporary connections with electric supply cables." J. H. Collie. July 29th.

18,803. "Portable electric lamps and means for generating current therefor." P. Cohn, Merrell's and D. Spurling. July 29th.

18,809. "Dynamo electric machines, &c." L. H. R. de Paemelaire. July 29th. (France, September 19th, 1918.)

18,829. "High-frequency signalling systems." Western Electric Co. (Western Electric Co.) July 29th.

18,830. "Electric switches." E. J. Harman and E. Le Bas. July 29th.

18,841. "Accumulators, &c." D. Fuller. July 29th.

18,863. "Electrically operated automatic reversible turnstiles." R. E. Wood July 30th.

18,873. "Sparking plugs." E. E. Bates and E. Perkins. July 30th.

18,879. "Apparatus for testing magnetos and sparking plugs." J. M. Tumbelty. July 30th.

18,891. "Magneto motor acting by repulsive movements between the poles." D. Suchostawer. July 30th.

18,896. "Electric heating devices and methods for making same." British Thomson-Houston Co. (General Electric Co.) July 30th.

18,910. "Electric lamps for vehicles." Fullers United Electric Works and A. P. Welch. July 30th.

18,918. "Electrical heating elements." E. J. Hazelton. July 30th.

18,928. "Incandescent electric lamps." L. A. De Becker. July 30th.

18,929. "Device for holding shades on bayonet electric lamp-holders." R. S. Atherstone. July 30th.

18,930-1. "Manufacture of electric batteries." R. S. Atherstone. July 30th.

18,932. "Storing electricity from variable power." W. P. Perry. July 30th.

18,933. "Method of indirectly coupling a radio-telegraphic antenna to high-frequency transformer." J. Bethenod. July 30th. (France, July 30th, 1918.)

18,941. "Sparking plugs." D. V. L. Fellows. July 30th.

18,942. "Dynamo electric motors." W. H. Glaser. July 30th.

18,950. "Magnetos." G. M. Turner. July 31st.

18,960. "Sparking plug." F. G. F. Hinton. July 31st.

18,963. "Electrical switches." W. Sparks and W. H. Tonks. July 31st.

18,964. "Electric heating apparatus." C. H. Archer, Automatic Telephone Manufacturing Co., and G. W. Simister. July 31st.

18,965. "Amplifiers for telephone circuits, wireless telegraphy, &c." K. E. Edgeworth. July 31st.

18,975. "Electric motors." A. Heurtebise. July 31st.

18,985. "Measured service telephone systems." Automatic Telephone Manufacturing Co. July 31st. (United States, February 12th.)

18,989. "Variable electrical condensers." J. Joseph and H. W. Sullivan. July 31st.

19,005. "Manufacture of carbon electrodes." E. C. R. Marks. (Soc. Anon. Italiana G. Ansaldo & Co.) July 31st.

19,014. "Electric lamps for vehicles." R. F. Rowe. July 31st.

19,042. "Obtaining alternating currents from existing three-phase systems." A. M. Taylor. August 1st.

19,056. "Electric heaters." British Thomson-Houston Co. (General Electric Co.) August 1st.

19,082. "Electric cut-outs." E. A. Lamkin. August 1st.

19,083. "Electrodes for welding, &c." H. D. Lloyd, Whitecross Co., and W. W. Wilson. August 1st.

19,086. "Distributors for magneto generators." E. C. R. Marks. (Splitdorf Electric Co.) August 1st.

19,102. "Electric switches." A. Pouchain. August 1st. (Italy, August 14th, 1918.)

19,108. "Means for starting internal-combustion engines adapted also for generating electric current." W. S. Jeal. August 1st.

19,109. "Portable electric cooker box." A. A. Hunt. August 1st.

19,110. "Telephone receivers." W. A. Jackson and Telephone Manufacturing Co. August 1st.

19,143. "Electro-magnetic apparatus." D. Cook. August 2nd.

19,167. "Magnetic cores with electric windings." W. A. A. Burgess. August 2nd.

19,172. "Electro-thermostat." J. A. Abbott. August 2nd.

19,182. "Shades, &c., for electric lamps." T. Phillips. August 2nd.

19,185. "Sparking plugs." W. A. Clark, H. G. Longford, W. W. Longford and Sphinx Manufacturing Co. August 2nd.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1917.

14,350. Electric transforming and converting apparatus. British Thomson-Houston Co. ((General Electric Co.) October 4th, 1917. (129,304.)

14,560. Circuit breakers for ignition apparatus. Remy Electric Co. November 10th, 1916. (129,309.)

14,652. Methods and apparatus for the amplification of small currents by electron discharge relays. British Thomson-Houston Co. (General Electric Co.) October 10th, 1917. (129,313.)

15,464. Aerial circuits for wireless telegraphy and other purposes. R. A. W. Watt. October 24th, 1917. (129,336.)

15,514. Electrical make-and-break contact. J. H. Potts. October 25th, 1917. (129,339.)

15,610. Wireless signalling systems. J. H. Rogers and H. H. Lyon. November 10th, 1916. (129,346.)

15,670. Electrical regulating apparatus. B. Davies, W. Judd and Eastern Telegraph Co. October 27th, 1917. (129,348.)

15,774. Electric arc lamps. A. H. Railing and A. E. Angold. October 30th, 1917. (129,355.)

15,888. Electrodes for electric arc welding. E. Languepin. October 31st, 1917. (129,360.)

16,021. Sound detectors. Western Electric Co., G. H. Nash, G. E. R. Penny, B. B. Grace and R. A. Mack. November 2nd, 1917. (129,364.)

16,054. Electrical heater. C. G. Nobbs and Falkirk Iron Co. November 3rd, 1917. (129,366.)

16,276. Electric regulating switches for use with ordnance and for other purposes. J. S. Wilson, W. E. Dalby, and Armstrong, Whitworth & Co. (129,373.)

1918.

7,711. Telephone systems. Western Electric Co. ((Western Electric Co.) May 8th, 1918. (129,397.)

9,115. Conversion of electric currents. C. N. Bennett and A. Lyon & Wrench. December 19th, 1918. (129,400.)

9,453. Electric heating apparatus for liquids. R. C. Watson. June 8th, 1918. (129,406.)

9,469. Electrically heated crucibles, melting pots, and the like. Morgan Crucible Co. and C. W. Speirs. June 8th, 1918. (129,407.)

10,799. Liquid electrical resistances. G. Dearle. July 2nd, 1918. (129,414.)

11,181. Electric batteries. L. Rabinovitch and A. Mond. July 8th, 1918. (129,423.)

11,197. Electric accumulators. S. J. Williams. July 8th, 1918. (129,425.)

11,304. Electric heating apparatus. H. J. C. Forrester. (H. Burgess.) July 10th, 1918. (129,438.)

11,336. Electric lamp switches. E. C. Leachman. July 10th, 1918. (129,440.)

11,444. Electric locomotives or cars. British Thomson-Houston Co. (General Electric Co.) July 12th, 1918. (129,449.)

11,868. Ignition sparking-plugs for internal-combustion engines. F. L. Rapson. July 20th, 1918. (Cognate application 12,480/18.) (129,467.)

12,877. Measuring and controlling electric power. British Thomson-Houston Co. (General Electric Co.) August 8th, 1918. (129,487.)

12,960. Electrolytic method of cleaning iron of steel. Q. Marino. August 9th, 1918. (129,489.)

13,455. Hammer interrupters for radiotelegraphy. Svenska Aktiebolaget Gasaccumulator. September 14th, 1917. (120,198.)

13,583. Magneto-electric machines for ignition in internal-combustion engines. British L.M. Ericsson Mnfg. Co. and A. Brookes. August 21st, 1918. (129,500.)

14,738. Terminal fittings of incandescent electric lamp-holders. G. F. Colson. September 11th, 1918. (129,511.)

14,767. Means for securing shades to the holders of electric lamps. H. F. Wheeler. September 11th, 1918. (Patent of addition not granted.) (129,512.)

14,917. Temperature indicators for transformers and the like. British Thomson-Houston Co. (General Electric Co.) September 13th, 1918. (129,515.)

15,868. Electric incandescent lamps. British Thomson-Houston Co. (General Electric Co.) September 30th, 1918. (129,524.)

19,468. Means for supporting the shade of an electric incandescent lamp. L. G. Flory. November 26th, 1918. (129,547.)

21,628. Apparatus for electric welding. T. E. Murray and J. B. Murray. March 19th, 1918. (124,188.)

21,779. Call-indicator for telephone systems employing automatic switching apparatus. Automatic Telephone Mnfg. Co. (Automatic Electric Co.) December 30th, 1918. (129,563.)

1919.

1,133. Sparking plugs for electrical ignition systems. A. Ogden. January 16th, 1919. (129,568.)

2,751. Electric wave meters. J. S. E. Townsend. February 4th, 1919. (129,579.)

4,542. Sparking plug. A. Sproul. February 24th, 1919. (129,591.)

5,057. Portable electric lamps. H. Dean and Chloride Electrical Storage Co. February 28th, 1919. (129,595.)

Heating Ingots Electrically.—Mr. T. F. Baily, in a paper presented recently to the American Iron and Steel Institute, expresses his belief that the electric soaking pit is, for the steel maker, the most promising development of the electric furnace; and in his opinion the time is not far distant when practically all modern mills rolling hot ingots will be using electric pits. This type of pit will eliminate the roll breakages due to cold ingots, delays occasioned by unevenly-heated ingots, and oxidation. To ensure a uniform temperature, the heating should be done by means of the walls of the pit rather than by direct radiation from the resistance elements. The latter, composed of broken carbon thrown loosely into a carborundum, fire-sand trough, supported on brick pillars, are located along the outer wall of each side of the pit, and protected against injury from the ingot by being recessed some distance back from the ingot cell. The heat from the resistance element is radiated to the circular wall of the pit, and thence to the cover, the partition wall of the pit, and to the ingots. The cross-section of the resistor element is such that there is little difference between its temperature and the ruling temperature of the pit. What is of the highest importance in obtaining uniformity of heating is that most of the heating is done by the walls of the pit rather than by direct radiation from the resistor element.—*Technical Supplement to the Review of the Foreign Press*

The X-Ray Examination of Materials.—In an article under this heading, the *American Machinist* of August 2nd gives a detailed account of the technique involved in examination of materials with the X-rays; the apparatus is described, and the numerous precautions which are necessary to prevent fogging by the production of secondary rays, and undue distortion of the image, are explained. The article is based upon the practice of Messrs. Harry W. Cox & Co.